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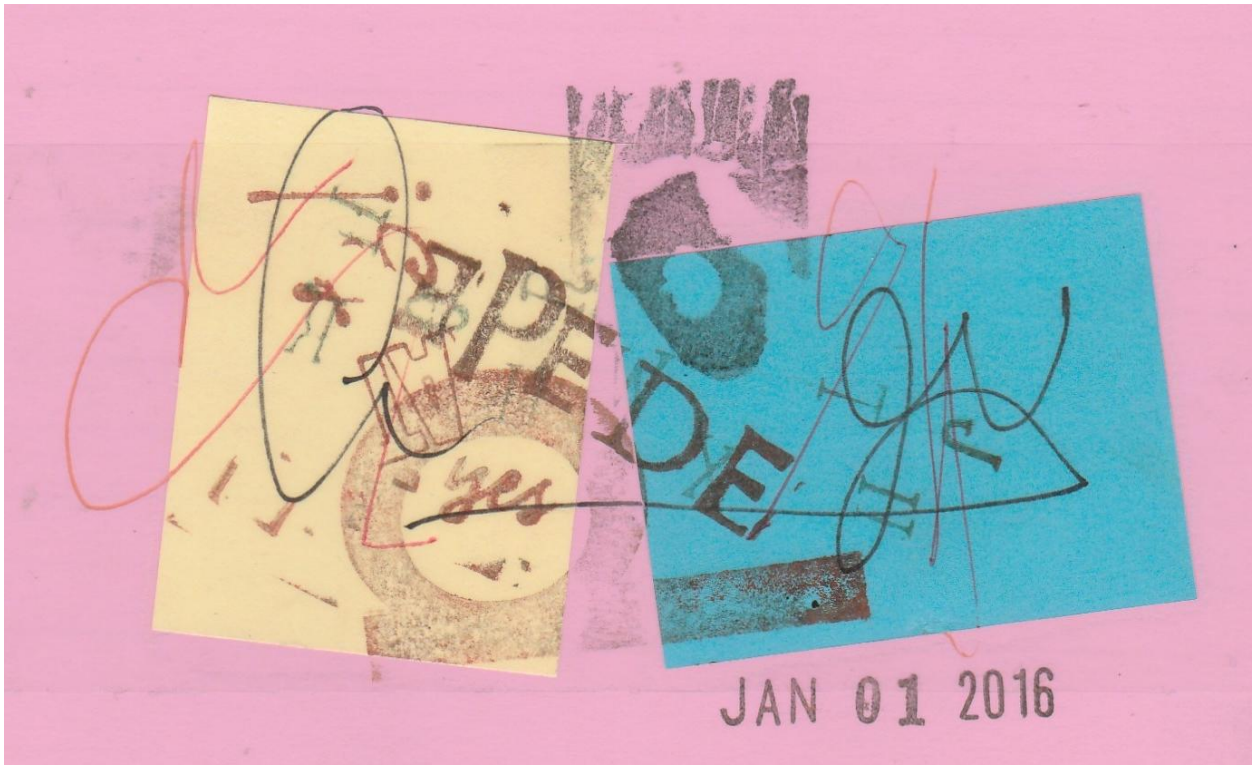

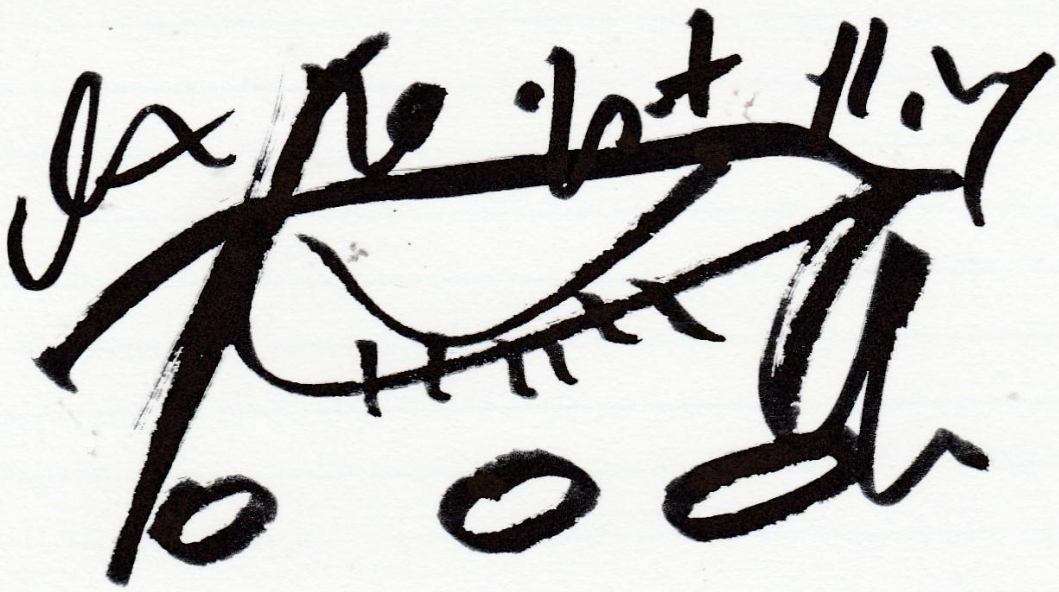

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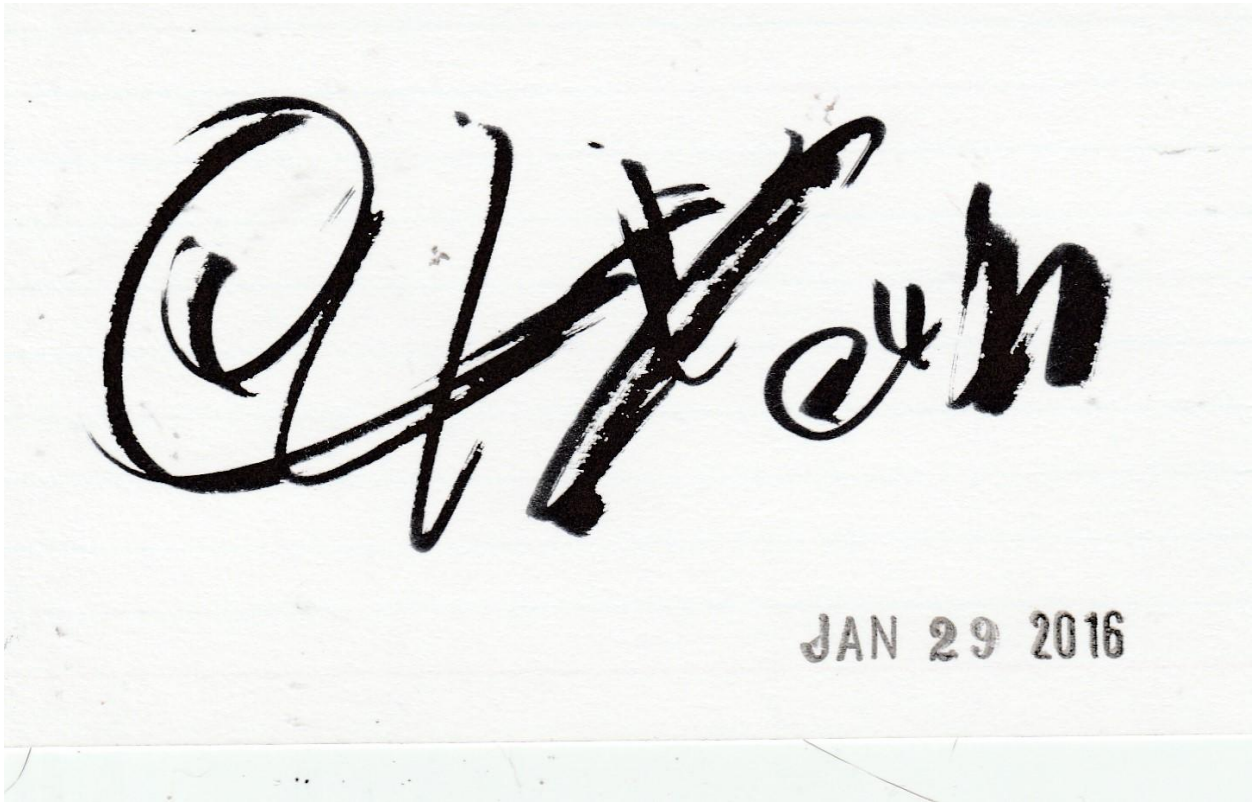
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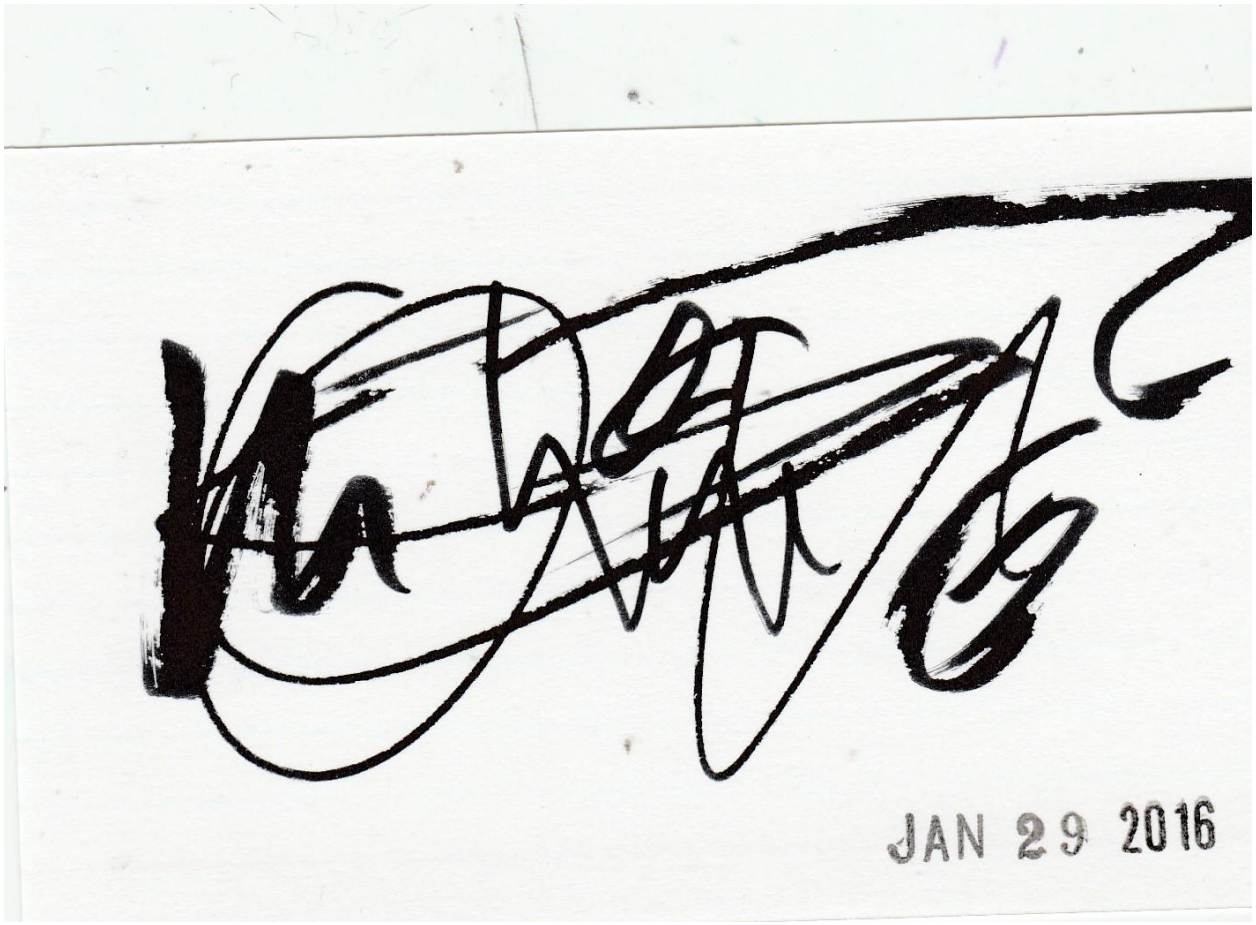
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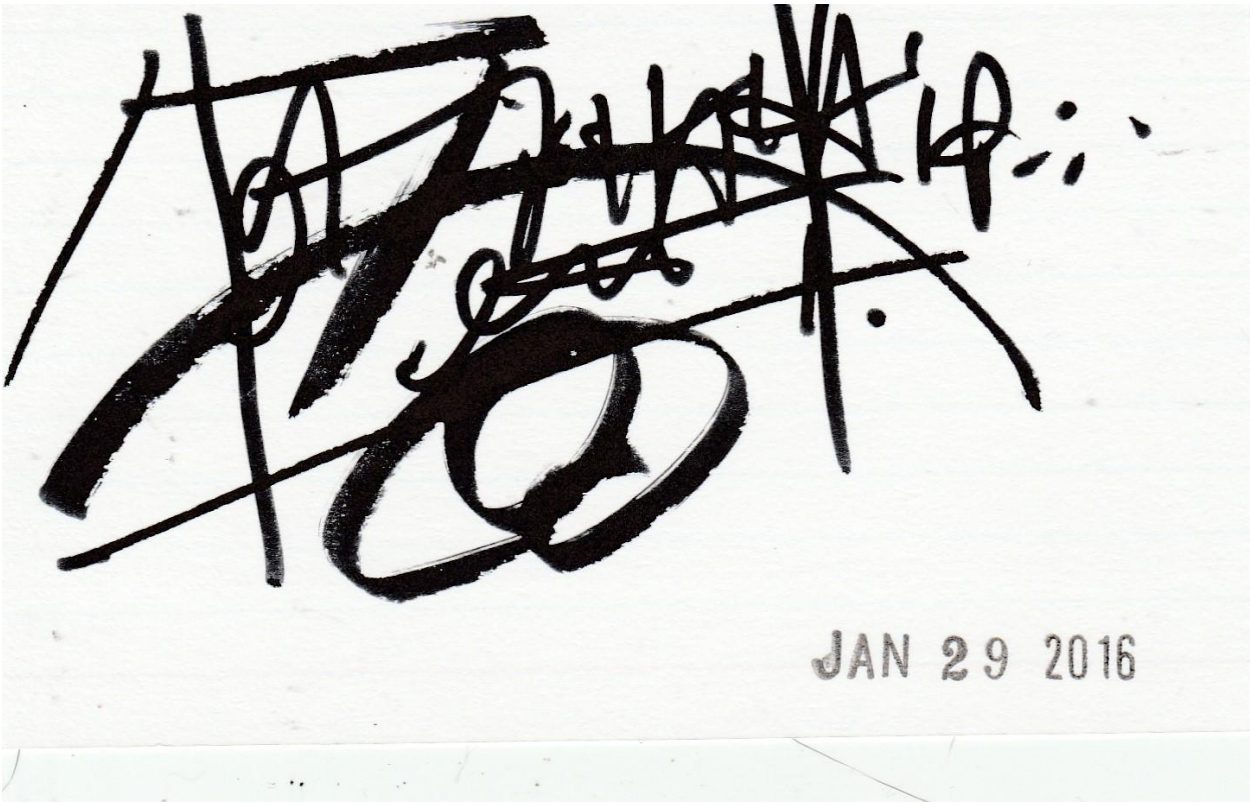
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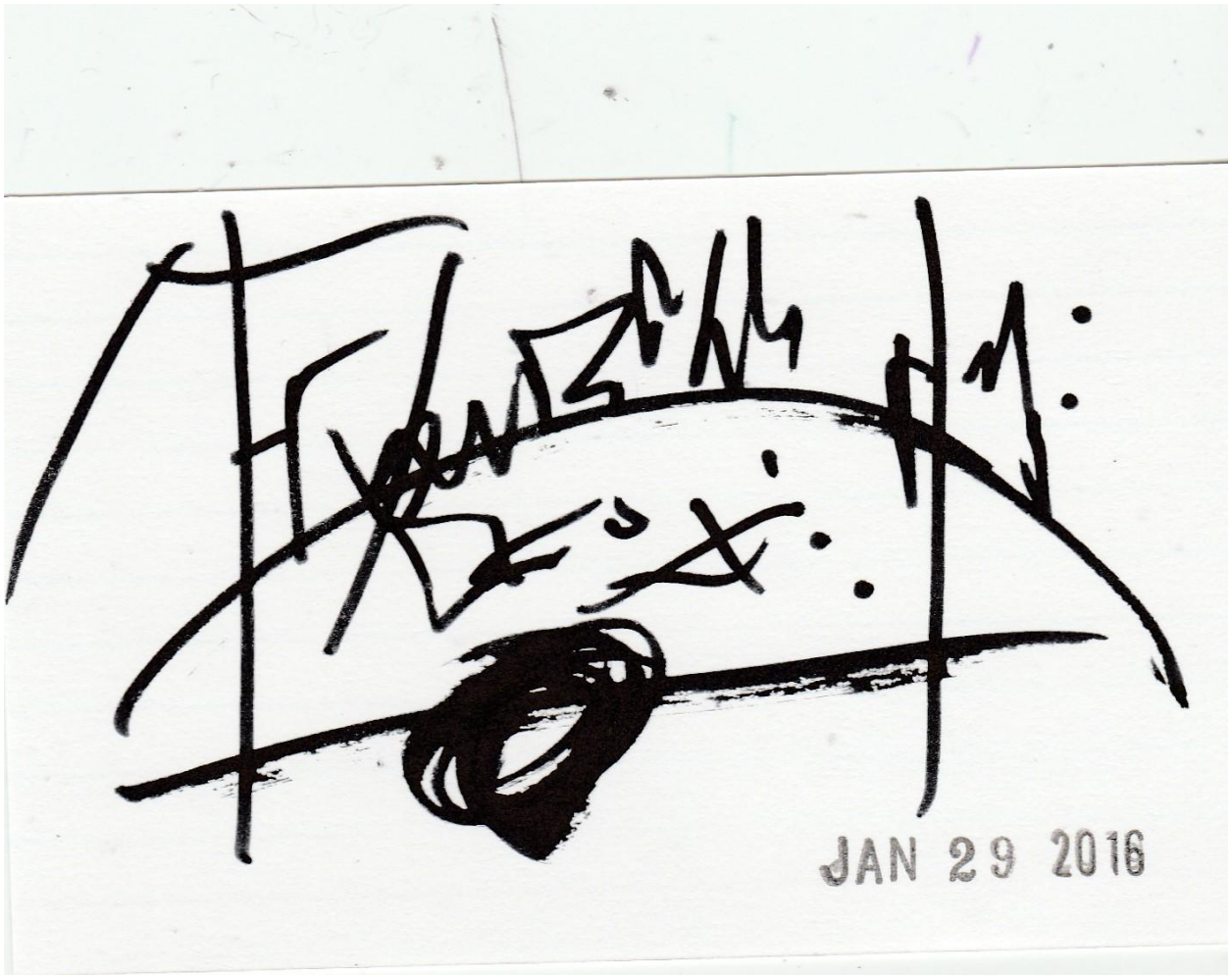
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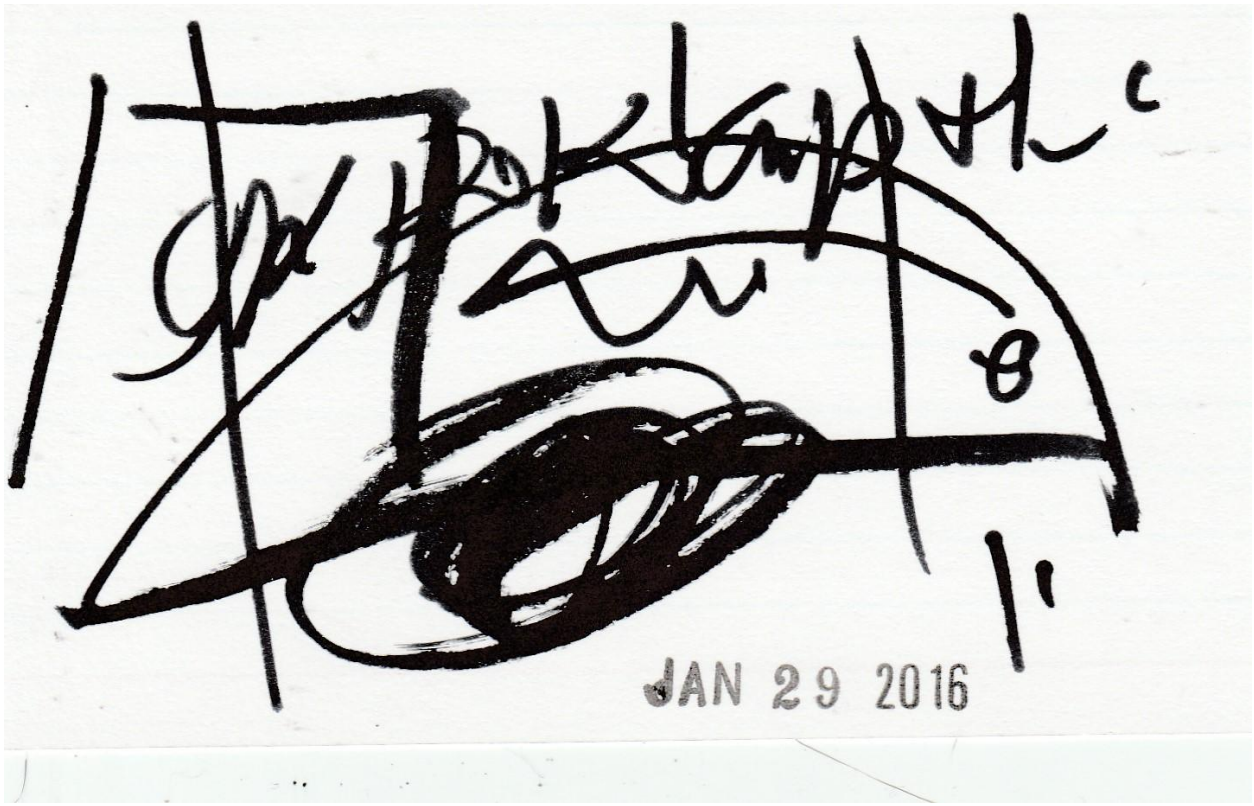

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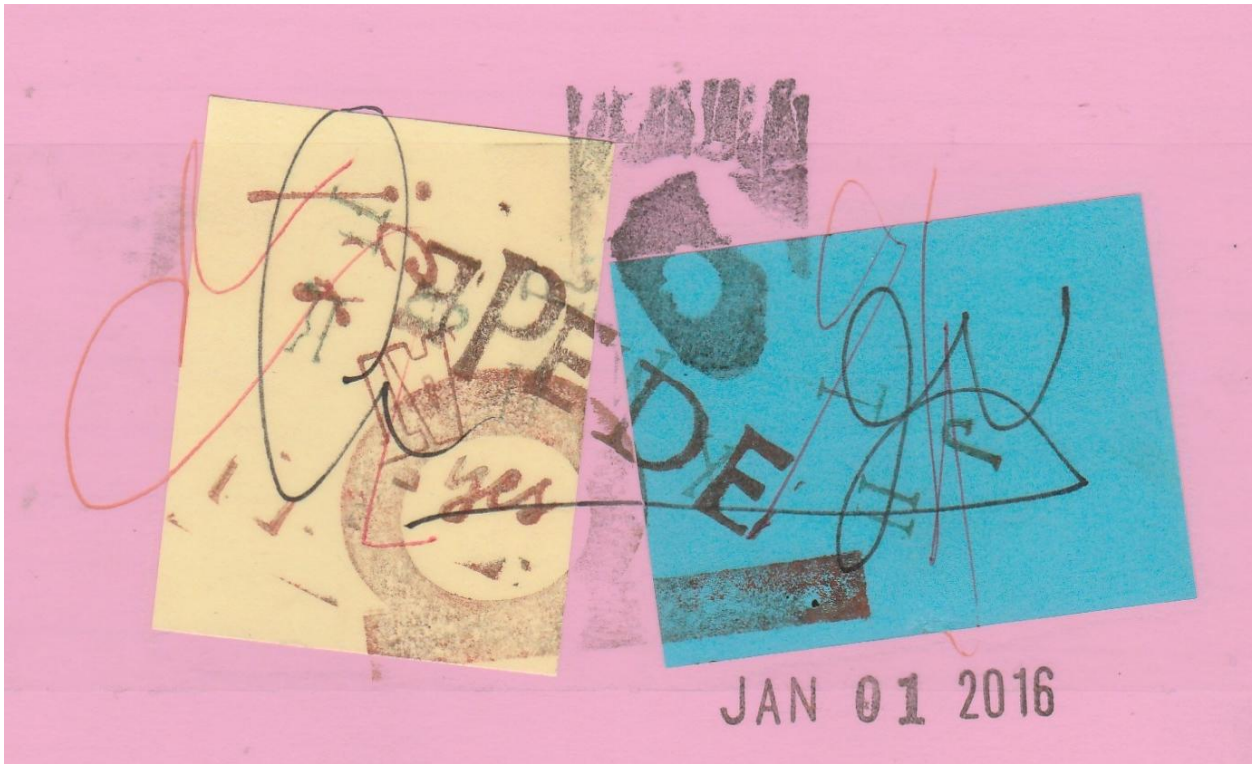
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If X in Figure 49 is a battery that drives a [illegible] around the circuit, then a quantity of heat flows a[illegible] un[illegible] of cross-sectional area of A, and a differen[illegible]s in B. At the junctions, there is a differe[illegible] that is absorbed at one junction (cooling) a[illegible] at the other (heating) depending on the dire[illegible]ren[illegible] flow. In effect, heat is removed from one junction and delivered to the other. The circuit acts as a heat pump—that is, it pumps heat from one junction to the other if the two materials are different.

In the Peltier experiment, if the two junctions are at different temperatures and the Peltier coefficient of material A varies with temperature, then the heat absorbed at one junction will not be the same as that evolved at the other. The difference must appear within the material A. This is the Thomson effect, the third thermoelectric effect, which is the absorption or emission of heat in a single material at a rate proportional to the current flow and the temperature gradient.

The Thomson coefficient is proportional to the change of the Peltier coefficient with temperature. The first two thermoelectric effects are also related to each other. The laws of thermodynamics lead to the "Kelvin relation," which states that, for any material, the Peltier coefficient is equal to the product of the Seebeck coefficient and the absolute temperature: $\pi = ST$.

Electronic origin. The origin of the thermoelectric effects can be understood in terms of the motion of the electrons or holes (a hole is equivalent to a positive charge, as it results from the absence of an electron) that carry the electrical current in a conductor. For a detailed discussion of these effects, see the articles ELECTRICITY AND MAGNETISM and THERMODYNAMICS.

The Seebeck coefficient is small in most metals, typically a few microvolts (10^{-6} volt) per degree Celsius. Semiconductors (materials which are neither good electrical conductors nor good insulators) have much larger values of the coefficient, in the range of hundreds or thousands of microvolts per degree Celsius. A semiconductor material is made *n*-type (*i.e.*, given an excess of negative charges) by the addition of a small amount of impurity that introduces an excess of electrons in the crystalline structure of the semiconductor. The addition of an impurity that produces a deficiency of electrons, or holes, yields *p*-type (*i.e.*, with an excess of positive charges) material. A junction between *n*-type and *p*-type material is called a *p-n* (or *n-p*) junction.

The number of excess electrons or holes determines the electrical resistivity of a metal or semiconductor. In general, the larger the concentration of carriers, the lower the resistivity. The resistivity of a semiconductor is much higher than that of most metals, since it contains fewer charge carriers.

Thermal conduction also depends on these carriers, increasing with increasing concentrations of electrons or holes. In metals, most of the heat is carried by the electrons or holes. In any solid, heat is also carried from hot to cold regions by the vibrations of the atoms about their normal positions in the crystal structure or lattice. This so-called lattice thermal conductivity is the most important mechanism operating in semiconductors with small numbers of electrons or holes—less than one per 10,000 atoms.

Basic thermoelectric devices. Semiconductors have relatively large thermoelectric powers and are thus preferable to metals as the active materials for most thermoelectric applications. In a basic device, two bars of semiconductor, called thermoelements, one *n*-type and one *p*-type, are joined with metal connections into a circuit, as shown in Figure 50. In an elementary refrigerator, X is a battery that drives an electron current around the circuit, as shown. Cooling occurs at both junctions J_2 and J_3, so that the *n*-type and *p*-type effects are added. Heat is evolved at junctions J_1 and J_4. If these are kept near room temperature by attaching air-cooled fins or a water-cooled heat sink (a device for disposing of heat), then the cooled junctions will be well below room temperature. With the best available semiconductors, arranged in this simple circuit, if the hot junctions are maintained at 68° F (20° C), the cold junctions can reach −58° F (−50° C), a difference of 126° F (70° C). Much lower temperatures can be achieved by "cascading" a thermoelectric refrigerator, an effect that is achieved by building several stages, each of which acts as the heat sink for the next.

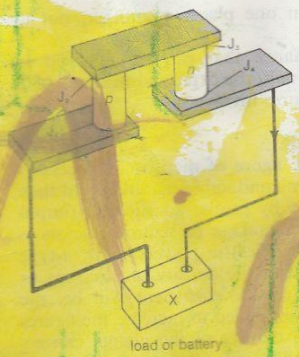

Figure 50: An elementary thermoelectric device (see text).

In an elementary thermoelectric generator, X in Figure 50 is an electrical load such as a motor or an electronic circuit. If the top junctions, J_2 and J_3, are heated while the lower junctions, J_1 and J_4, are kept near room temperature, a current will flow through the load. Again the effects of the two types of semiconductor are added, and increased conversion efficiency is obtained. With the best available materials, heat can be converted into electrical energy with an efficiency near 10 percent, or somewhat higher if several stages are cascaded.

Figure of merit. In both types of device, the performance depends on the properties of the two semiconducting materials. In a refrigerator, the Peltier effect (and therefore, by the Kelvin relation, the thermoelectric power S) must be large to maximize the cooling effect; the resistivity (ρ) must be small to minimize Joule heating; and the thermal conductivity (κ) must be small so that a large temperature difference can be maintained. Similarly, in a generator, a large thermoelectric power (S) is required to maximize the voltage produced by the temperature gradient; a small ρ results in minimum waste of electrical power by Joule heating; and low κ prevents the heat from flowing wastefully through the thermoelements.

In either device, when the efficiency or performance is calculated, the material parameters always occur in a certain combination: $Z = S^2/\kappa\rho$, where Z is known as the figure of merit since the device efficiency improves with increasing Z. This equation states that the figure of merit of a semiconductor material is given by the square of its Seebeck coefficient divided by the product of its resistivity and its thermal conductivity.

If both materials have properties that are identical except for the sign of S, this figure of merit (Z) applies to each material separately and also to the couple as a whole. If the properties are different, Z for the couple must be calculated.

The figure of merit enters, along with the absolute temperatures of operation of the device, into various calculations of device performance. Important characteristics are as follows:

1. Efficiency of a generator, symbolized by the Greek letter eta (η), is the ratio of the maximum electrical power delivered to a load to the rate of heat flow through the thermoelements. For infinitely large Z, this becomes the maximum efficiency attainable in thermodynamic theory—the so-called Carnot efficiency—and is always less than 100 percent.

2. The maximum temperature difference (symbolized ΔT_{max}) that can be achieved with a single-stage refrigerator is one-half the product of the figure of merit and the square of the cold junction temperature: $\Delta T_{max} = \frac{1}{2}ZT_c^2$.

3. The coefficient of performance of a refrigerator is the ratio of the heat removed from a load to the electrical power used in the device. For infinitely large Z this becomes the thermodynamic limit, [illegible] which can be larger than 100 percent because electricity is being

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JAN 14 2016

Introduction

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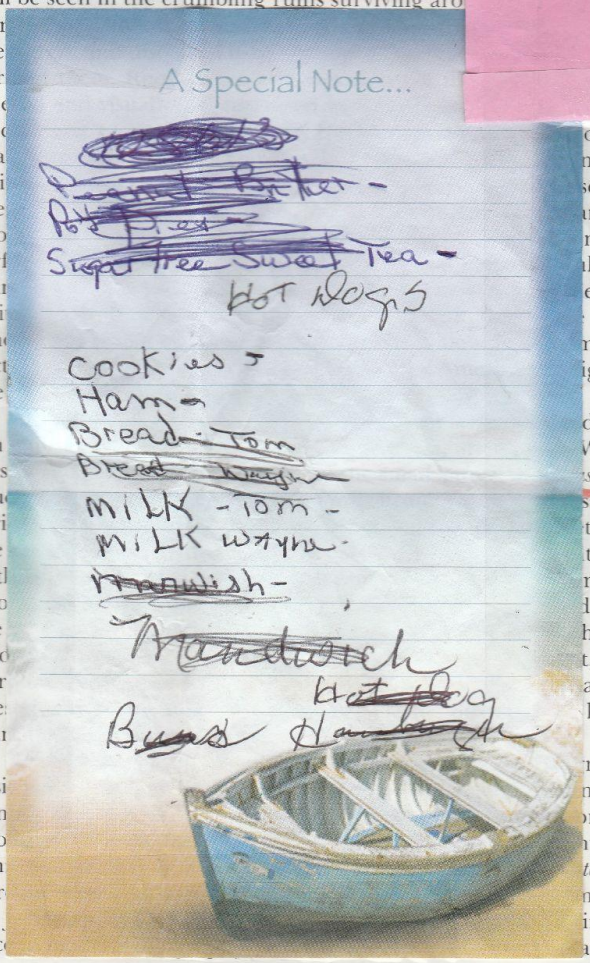

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ASTRONOMY. The angular rate of change in the position of a star on the celestial sphere.

PROPER MOTION *is measured by ... itions of a star on photographs taken ov*

prophase \'prō-ˌfāz\
BIOLOGY. A stage ... the appearance ... spindle and the ...

PROPHASE *is p... phase.*

proportion \p(r)...
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protective coloration
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The PROTECTIVE COL... *markings in shades o...*

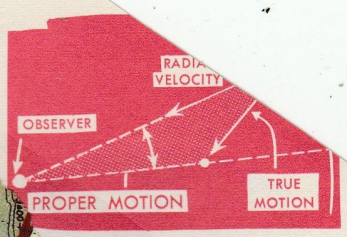
protein \'prō-ˌtēn\ *n.*
CHEMISTRY. Any one of ... pounds composed of n... make one very large m... carbon, hydrogen, nitr... and phosphorus, and a... ganisms.

Concentrated nitric acid ... PROTEIN *produces a yell...*

prothorax \(')prō-'thō(ə)r-ˌaks\ *n.*
ZOOLOGY. The first, or front, segment of the three segments in the thorax of insects. The prothorax bears the first pair of legs.

The PROTHORAX *of the locust includes a saddlelike covering usually extending back to the base of the wings.*

proton \'prō-ˌtän\ *n.*
CHEMISTRY and PHYSICS. A subatomic particle with an atomic mass of one (about 1,836 times the mass of an electron) and an electric charge of plus one. It forms the nucleus of an ordi-



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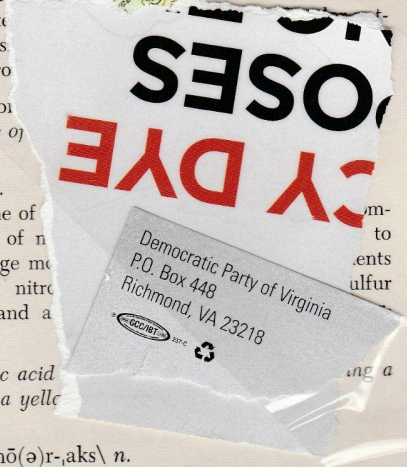

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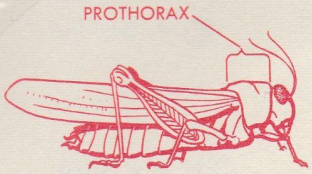

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Oberto
Bruno Munari

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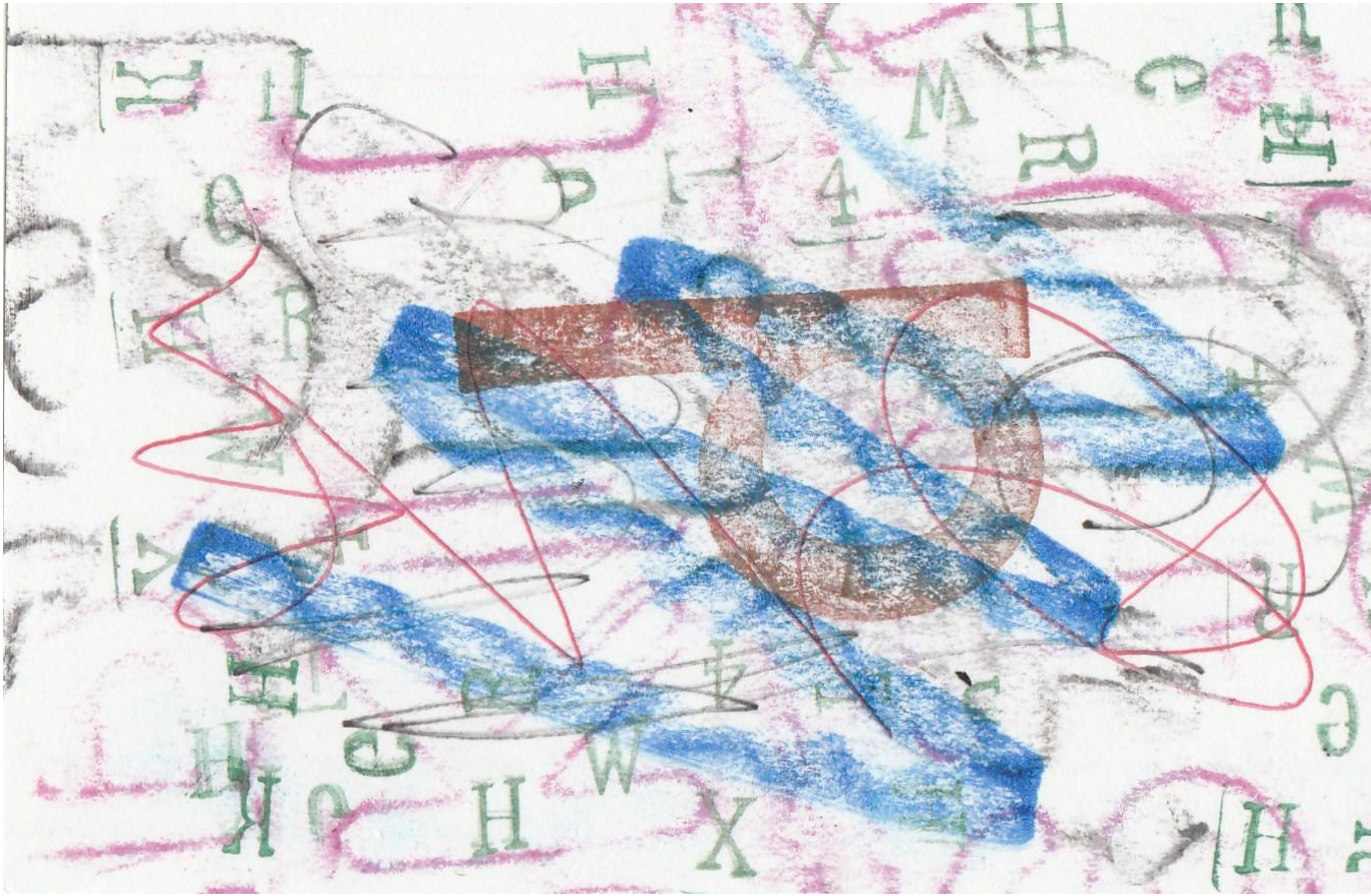

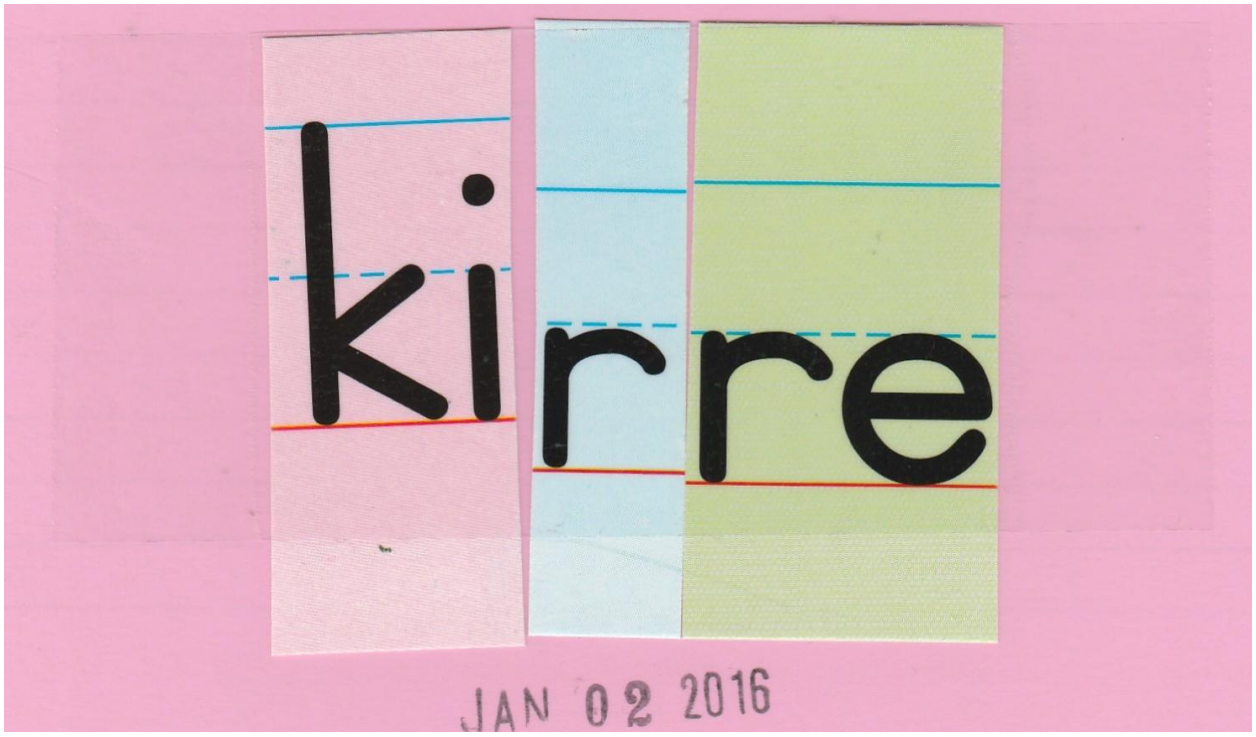
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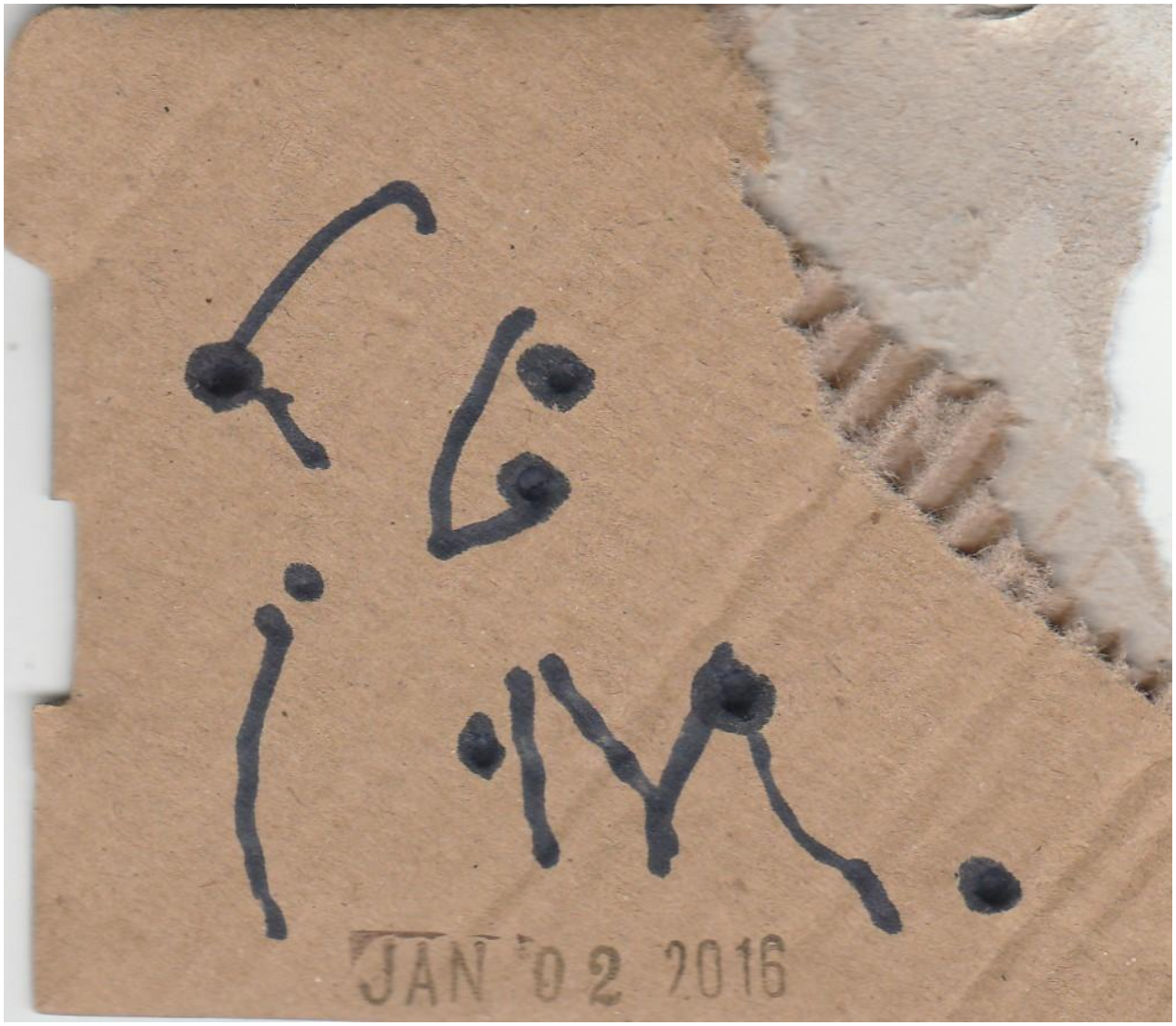
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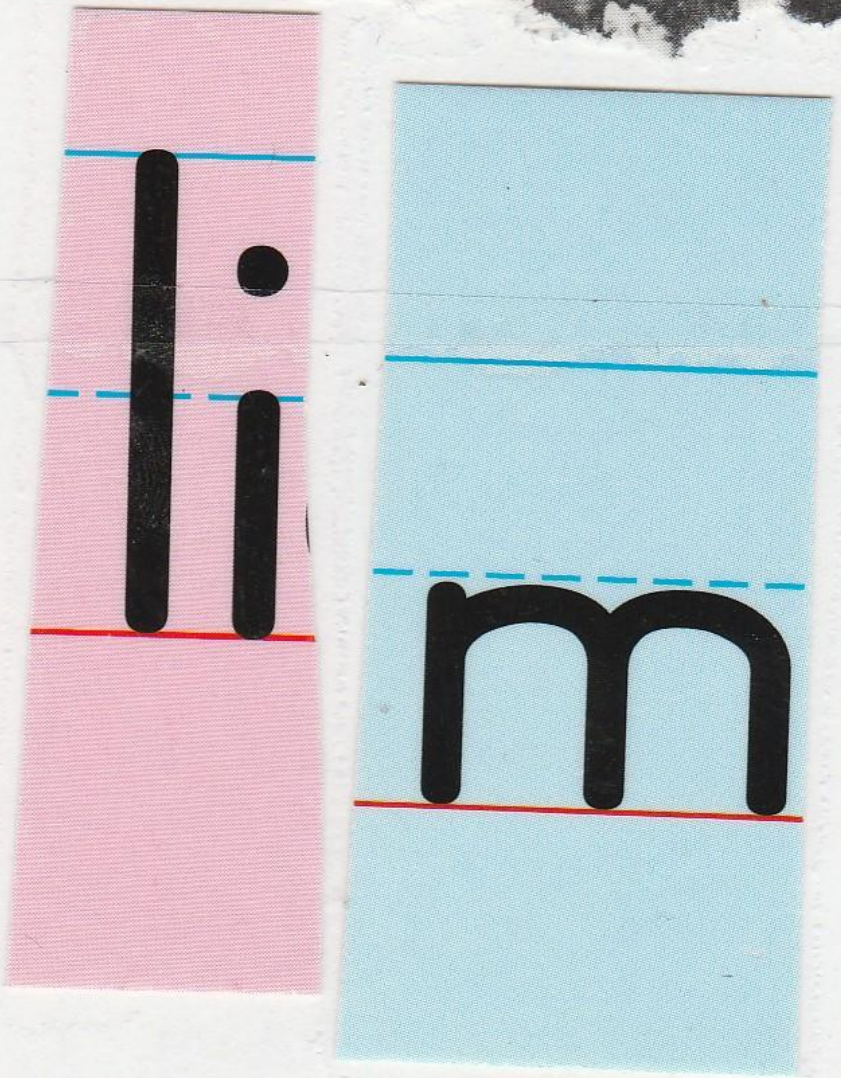

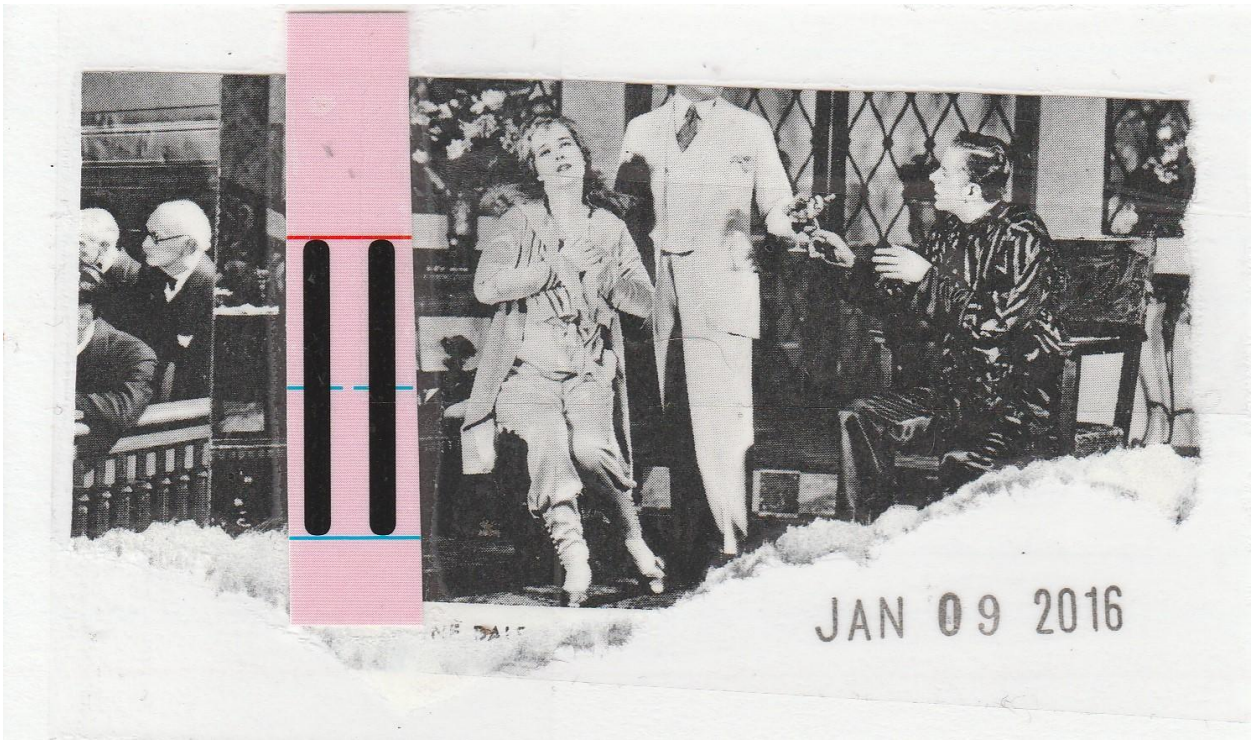
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nuclear physics

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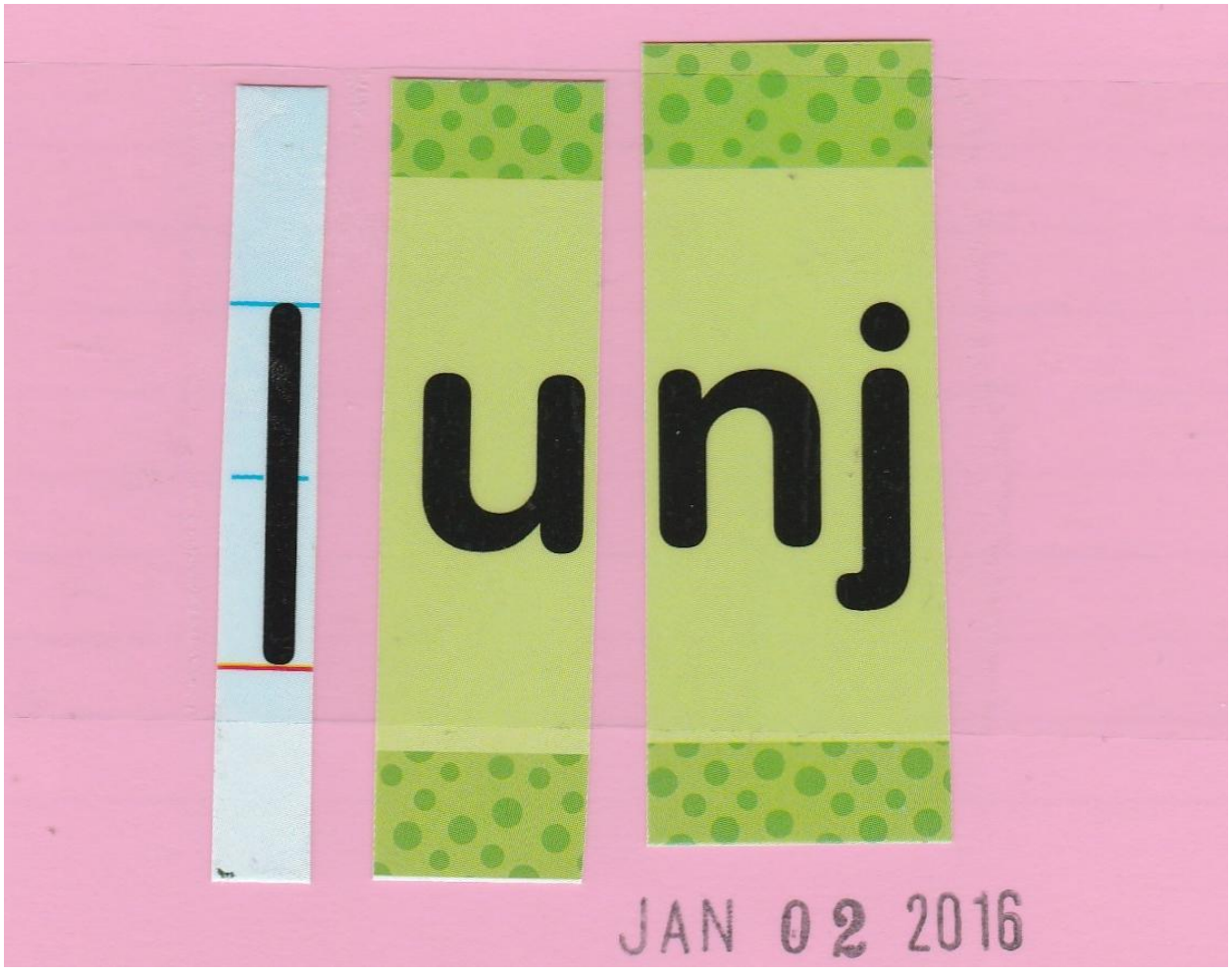
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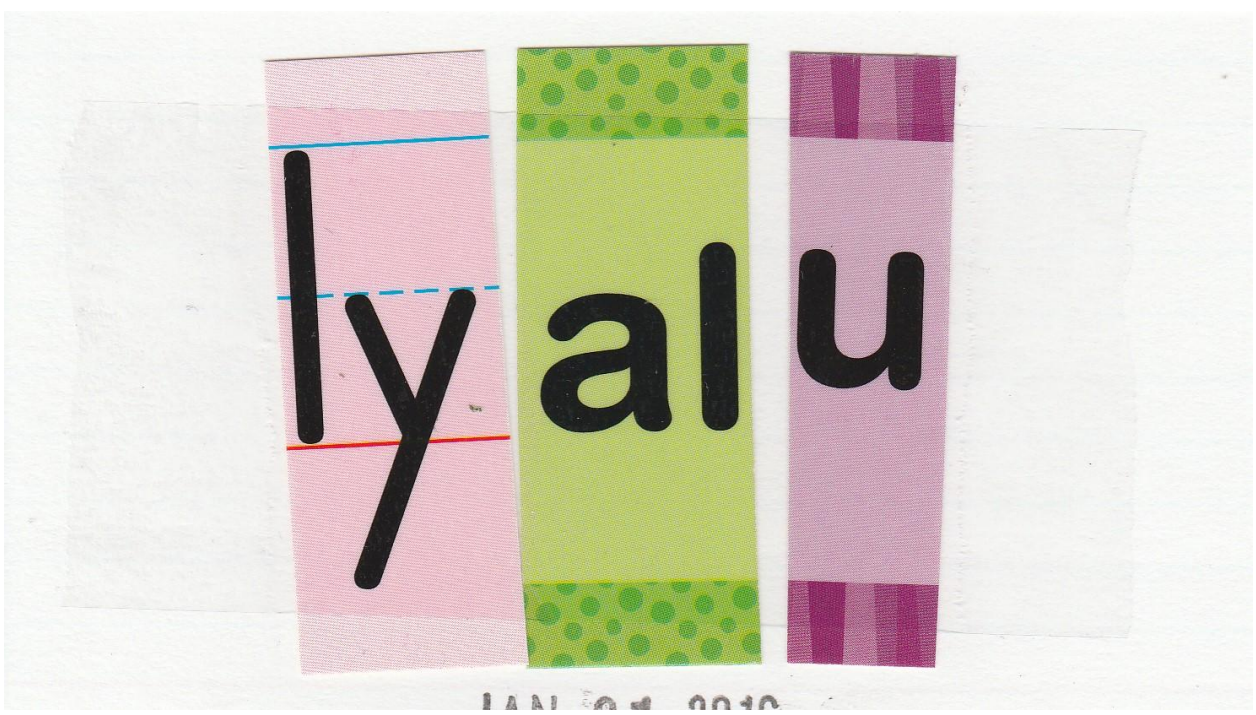
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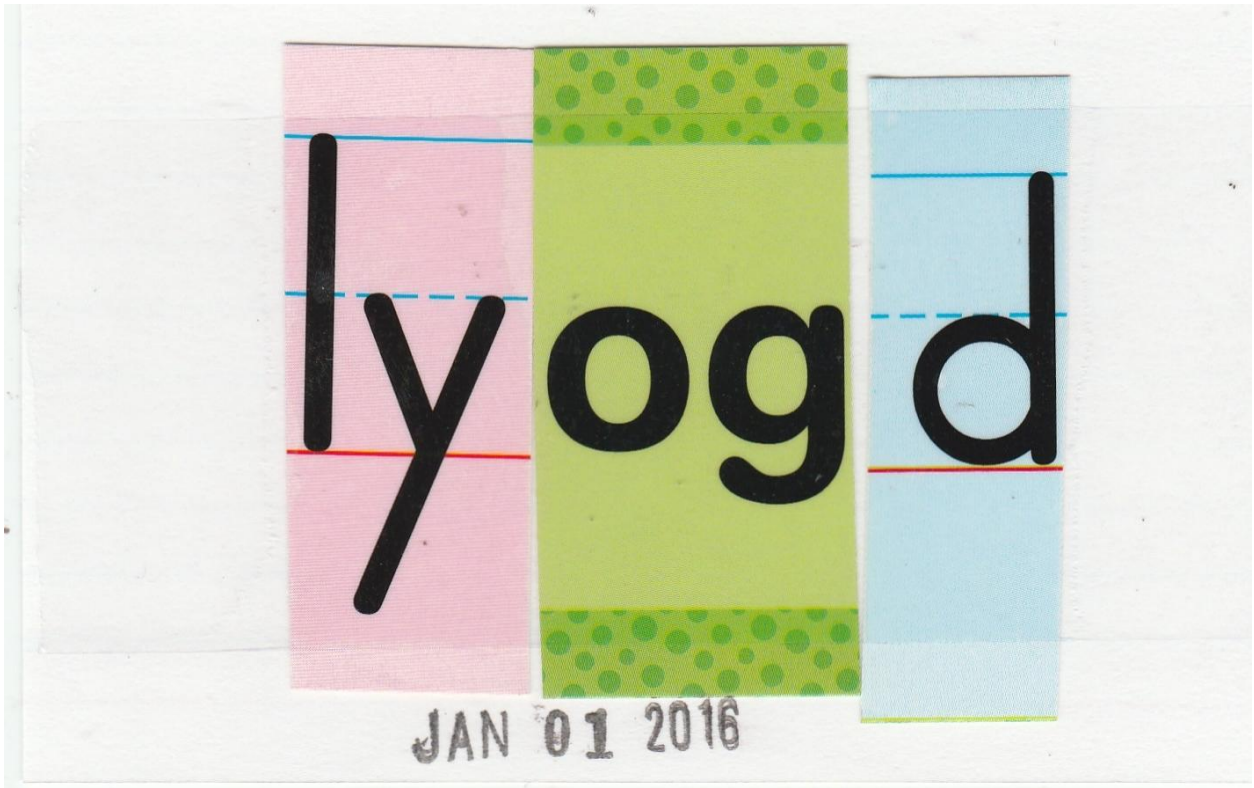
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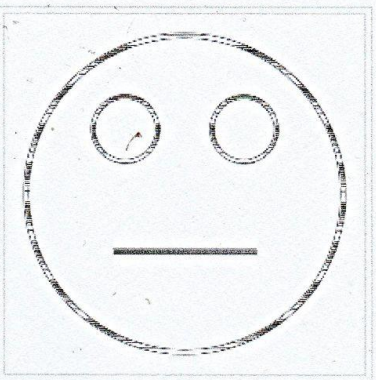
Pareidolia is a type of apophenia involving the perception of images or sounds in random stimuli.

For example, hearing a ringing phone while taking a shower. The noise produced by the running water provides a background from which the mind perceives the sound of a phone. A more common example is the perception of a face within an inanimate object – the headlights and grill of an automobile may appear to be "grinning". People around the world see the "Man in the Moon".[11]

People sometimes see the face of a religious figure in a piece of toast or in the grain of a piece of wood.[12]



This figure, which consists of three circles and a line, is considered to be a face, despite having only a few of the features of an actual face. Such perception facilitates facial recognition.

Overfitting

In statistics and machine learning, apophenia is an example of what is known as overfitting. Overfitting occurs when a statistical model describes random error or noise instead of the underlying relationship. This usually occurs when a model is excessively complex relative to the amount of data or observations rather than fitting a generalizable pattern in a general population.

Gambler's fallacy

Apophenia is well documented as a rationalization for gambling. Gamblers may imagine that they see patterns in the numbers which appear in lotteries, card games, or roulette wheels.[13] One variation of this is known as the "gambler's fallacy".

Hidden meanings

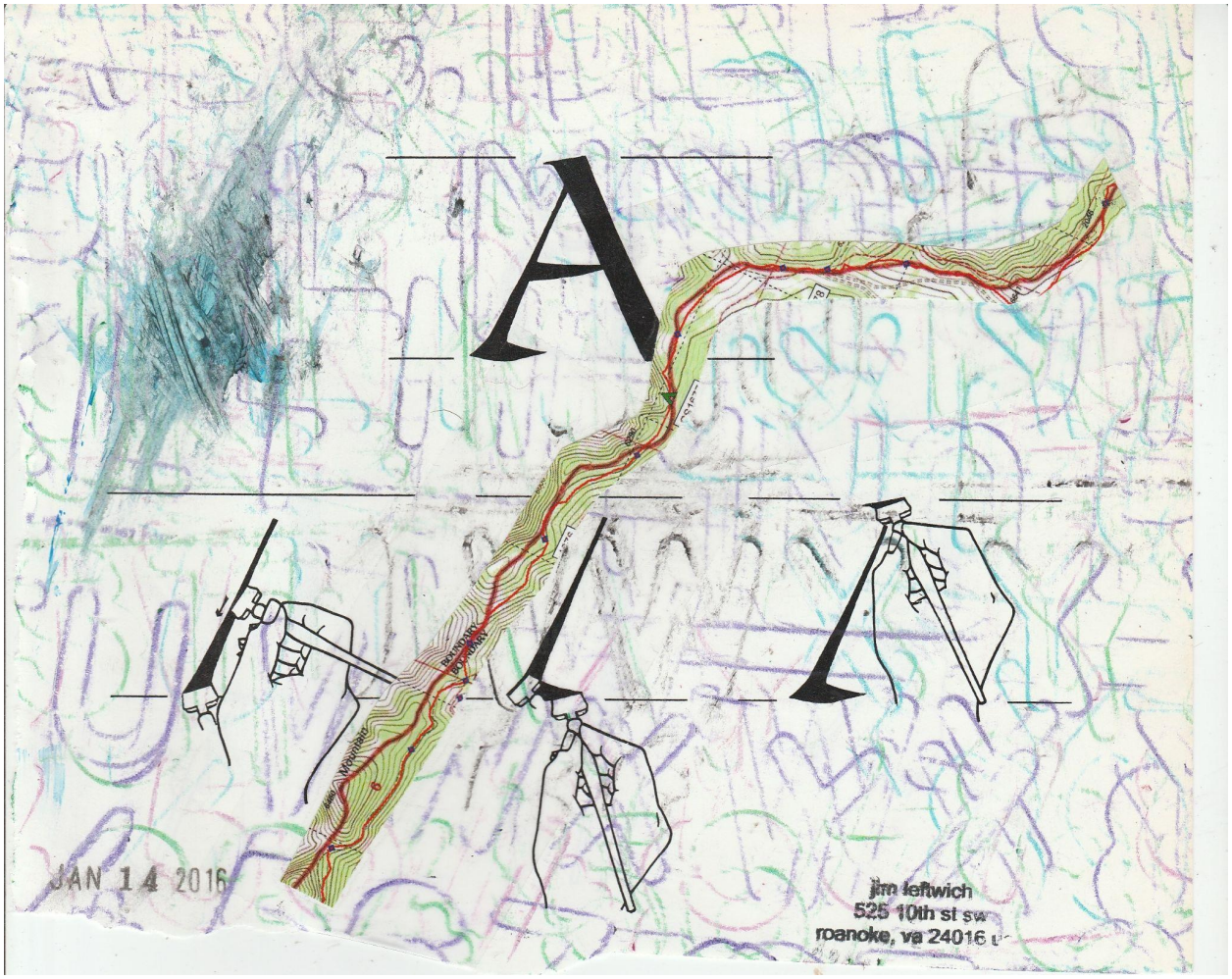
Divination, augury, and numerology are often based upon discerning patterns seen in what most people would consider to be meaningless chance events. The concept of a Freudian slip is based upon what had previously been dismissed as meaningless errors of speech or memory. Sigmund Freud believed that such "slips" held meaning for the unconscious mind (see *The Interpretation of Dreams*).

In literature

- William Gibson's *Pattern Recognition*
- Jorge Luis Borges's *Library of Babel*
- Umberto Eco's *Foucault's Pendulum*
- Stanisław Lem's *His Master's Voice*
- Peter Watts's *Blindsight*

See also

- 23 enigma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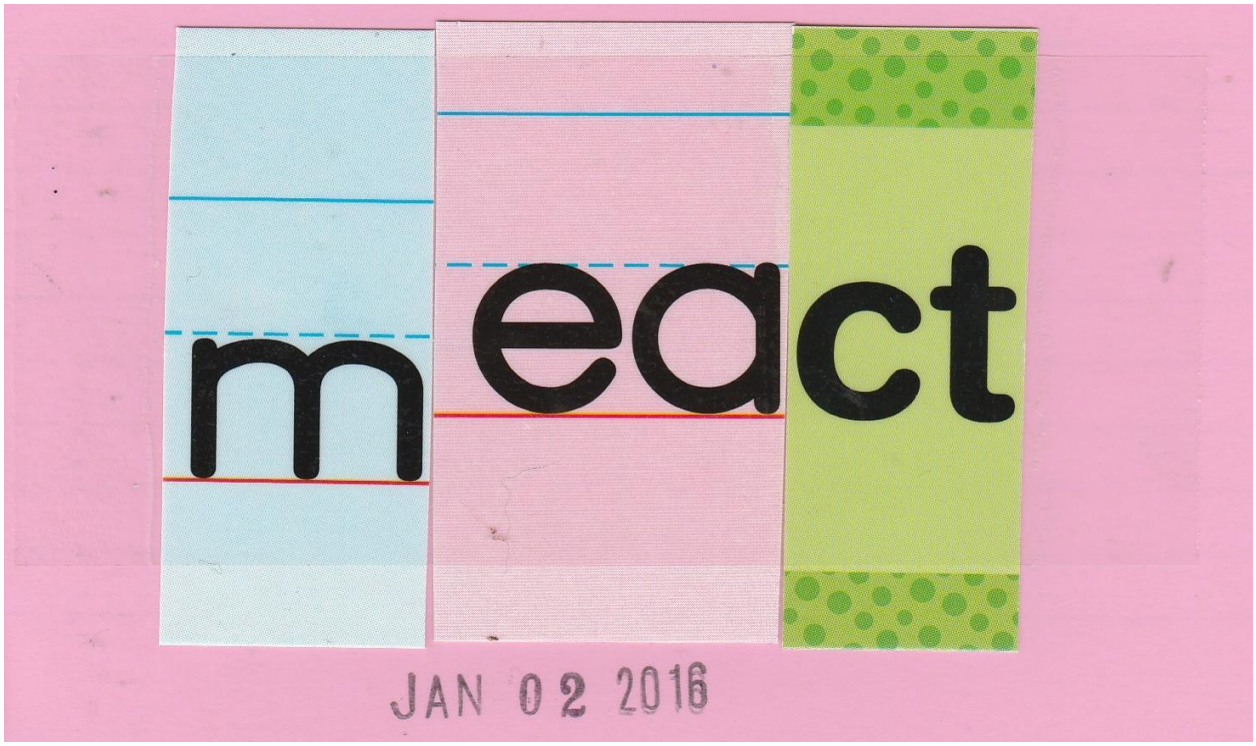
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quency requirements for an induction furnace are similar to those used for through heating of billets. The average specific power consumption for furnaces with a capacity of 330–440 pounds (150–200 kilograms) and more of steel is about 1.1 kilowatt-hours per pound (0.6 kilowatt-hours per kilogram) and increases somewhat for smaller furnaces.

DIELECTRIC HEATING

Basic principles. The dielectric ("capacitance") heating method is based on the utilization of heat created in materials that are poor electrical conductors, when placed in high-frequency electromagnetic fields. The heat is formed as a result of losses that occur in a material located between metal walls that form a sort of capacitor connected to the high-frequency generator. The amount of the loss is a characteristic of the material called its loss factor, or "loss angle."

"Loss angle"

In contrast to induction heating, in which nonuniform heating is possible, capacitance heating provides comparatively uniform through heating of objects made of various dielectrics (wood, plastic, rubber, food products, etc.), which are located in the high-frequency field of the capacitor.

The dielectric heating method has been successful in solving problems in which it was necessary to heat poor conductors. Depending on the structure and physical properties of these poor conductors, it is quite possible to select the optimal frequency and applied voltage for heating them.

Heating insulating materials and poor conductors usually requires substantially less specific power than heating metals. Thus, to heat a layer of metal of a thickness, for example, of 3 millimetres for surface hardening, a thousand or more watts of high-frequency energy are required for each square centimetre of surface. For the high-frequency drying of large volumes of wood, on the other hand, the average power is usually less than one watt per square centimetre. But because of the high electrical resistance of the insulators, generating the necessary heat requires much higher frequencies than in the induction heating of metals.

At low frequencies even high voltage does not ensure the required power. Therefore, the frequencies used for dielectric heating vary from hundreds of thousands of hertz to many gigahertz (1 gigahertz = 1,000,000,000 hertz).

A type of electron tube known as the magnetron is widely used in industry to generate high-frequency power in the gigahertz range. Developed about 40 years ago, magnetrons were used during World War II in radar generators, combining high output powers with extremely high frequencies (see also ELECTRONICS, *Electron tubes*). At the present time there are magnetrons capable of continuous operation with effective power outputs of the order of several kilowatts at frequencies in the 3,000 to 30,000 gigahertz (and even higher) range.

Applications. Of many industrial applications of dielectric heating, only a few will be discussed.

Drying of wood. The average power consumption in evaporating one kilogram of water from wood is about 2.5 kilowatt-hours. To determine the parameters of the apparatus, it is necessary to determine the weight of the water to be removed during drying on the basis of the job specifications.

High-frequency drying is normally used only for the final processing of lumber that has been seasoned in kilns, containing, for example, 20 percent moisture. The final moisture content in such cases is usually about 10 percent. Thus, the power and time requirements for a drying operation are directly related to the amount of moisture represented by this drop from 20 percent to 10 percent.

The duration of the drying process, however, is controlled by the danger of cracking the lumber due to the formation of steam and the rupture of the fibres. In general, the time will be around one hour per 10 millimetres of thickness of the boards. For example, a board 40 millimetres thick should dry in not less than four hours, and a board 20 millimetres in thickness may be dried in two hours.

Cracking

Heating of ceramic products. Many ceramic firms employ dielectric heating of ceramic products during their production cycles. Capacitor-type heaters are used with the ceramic products placed between the plates of the capacitor. In many cases a conveyer belt is used to transport the products between the plates of the capacitor, thus making it possible to automate the process.

Confectionery and culinary industries. One of the relatively new applications of the dielectric heating technique is in the confectionery and culinary industries. In these applications the product is placed between capacitor plates connected to a radio-frequency generator. The heated products never come into contact with the conductors; the heat generated within them is proportional to the frequency and depends on their physical properties.

Baking and preparing roasted meat dishes by no means exhaust the culinary possibilities of this technique; it is widely used in the food industry, and equipment is available for both restaurants and homes.

Melting glass and other dielectrics. Many materials that are good dielectrics at room temperature become conductors when heated. Glass, for example, heated close to its melting point, about 1,472° F (800° C), becomes a comparatively good conductor.

Radio-frequency heating can be used successfully for melting glass and glasslike materials (including various types of rocks), but the process is not effective until the temperature is increased to a point at which the material becomes conducting. Thus to start melting, a small portion of the material must be heated close to the melting point by some other heat source, such as gas burners. The high-frequency power is then switched on and the preheated conducting zone begins to increase its temperature and goes into the liquid state.

A valuable feature of the above-described method is the possibility of enlarging or reducing the dimensions of the molten zone, depending on the amount of generator power. A dynamic equilibrium is established; there is a certain minimum power below which the process does not take place, and the molten material hardens. In this regard the heating of glass differs substantially from the high-frequency heating of metals, which may be heated as much or as little as desired.

(M.G.L.)

NUCLEAR REACTORS

A nuclear reactor is a device designed to permit self-sustaining and controlled nuclear fissions, with the object of generating heat, producing radioactive isotopes or plutonium, developing an intense field of nuclear radiation, or serving some other useful purpose. Nuclear fission is the phenomenon in which an atom of fissionable material disintegrates when struck by a neutron, producing two entirely different atoms and generating a large amount of heat. In the fission process, neutrons are also given off, and these neutrons can cause more atoms to fission, thus leading to the possibility of a chain reaction. In the atom bomb this chain reaction is uncontrolled; in a nuclear reactor it is very carefully controlled.

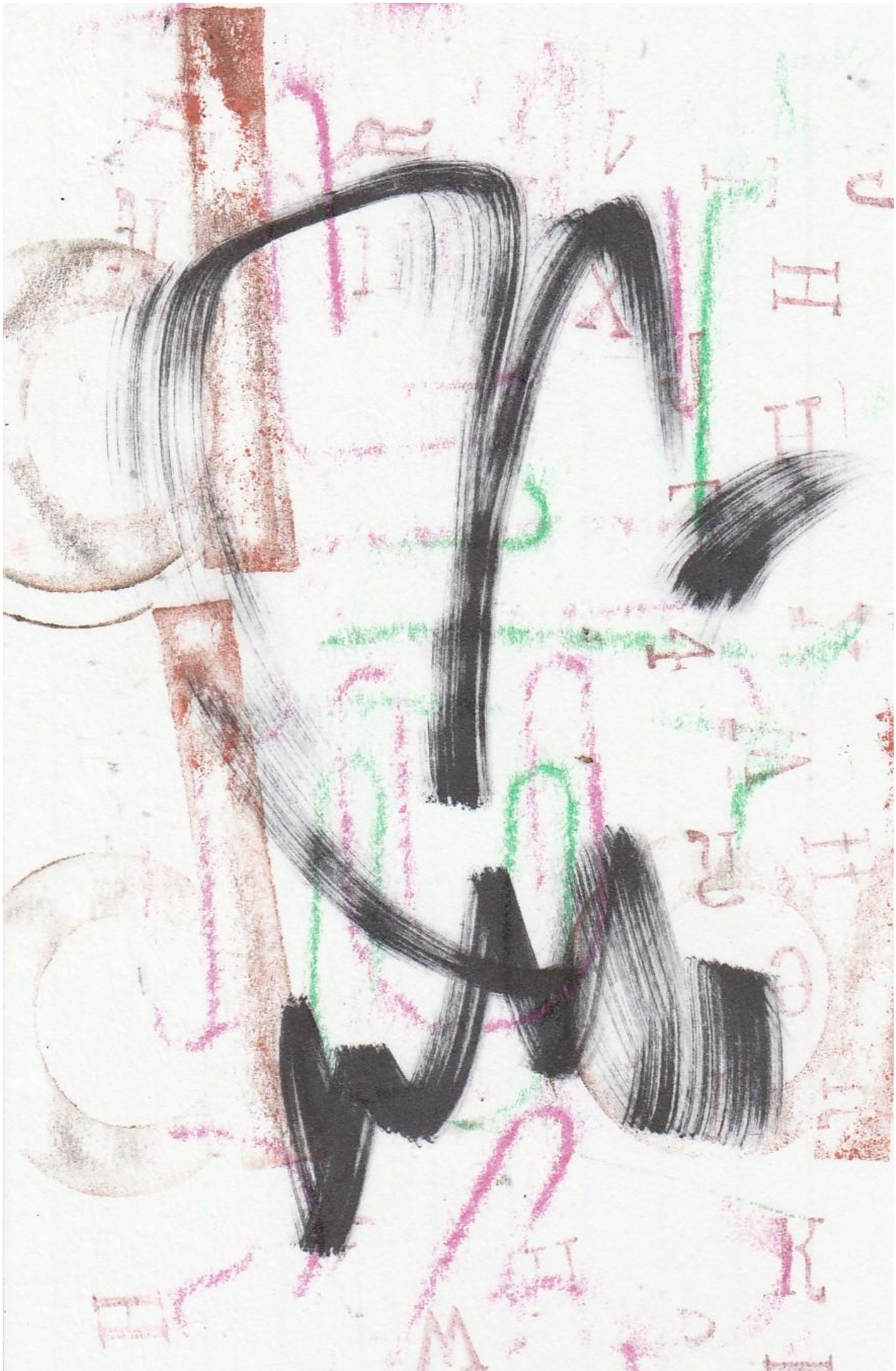
Fission process

The amount of heat generated in the fission process is very large. If all the atoms in a pound (0.45 kilogram) of uranium-235 were to undergo fission, the heat produced would be equivalent to burning 1,500 tons of coal. This phenomenon is the basis of the major application of nuclear reactors: the production of large amounts of heat for electrical power generation.

Whenever nuclear fission occurs, the two atoms that are produced are radioactive, often intensely so. They may spontaneously release highly penetrating gamma rays (X-ray-like radiation) and generally less penetrating beta rays (electrons). A nuclear reactor, therefore, is potentially a source of heat, neutrons, and radiation.

NUCLEAR-REACTOR PRINCIPLES

The chain reaction. For a chain reaction to take place, it is necessary for at least one of the neutrons released

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roanoke, va 24016 usa
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jim leftwich
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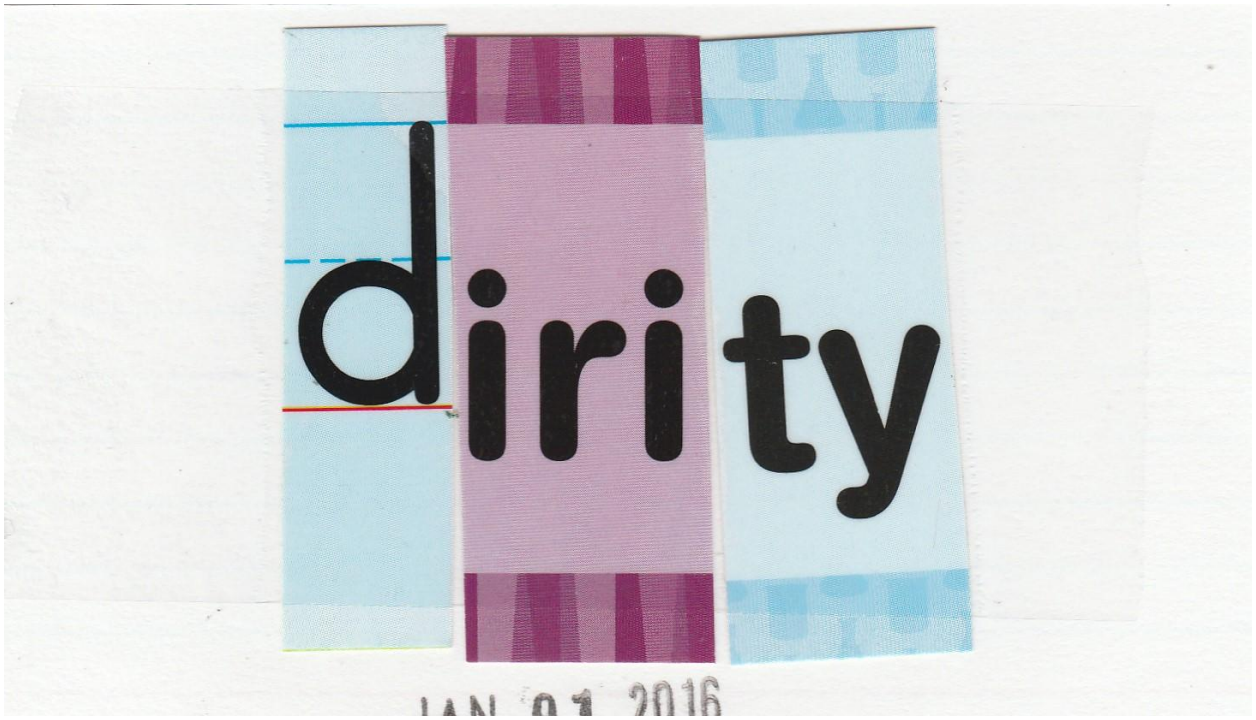

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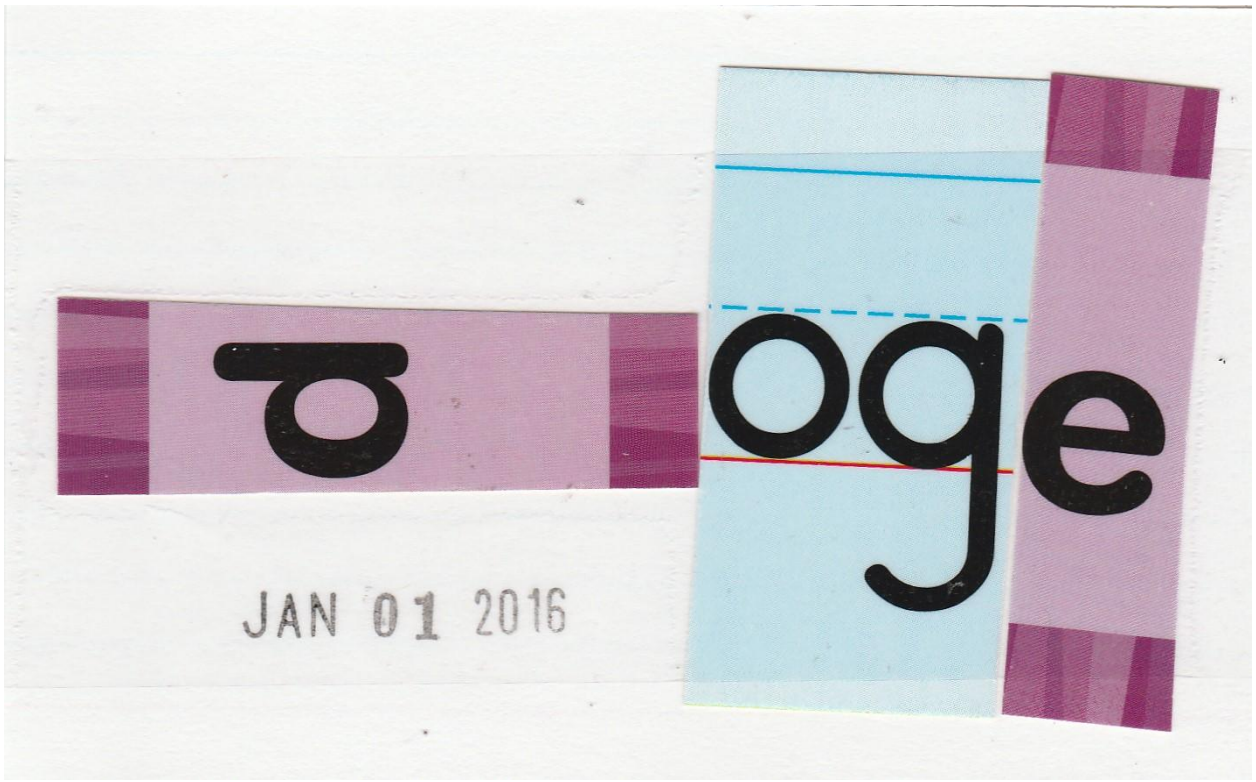

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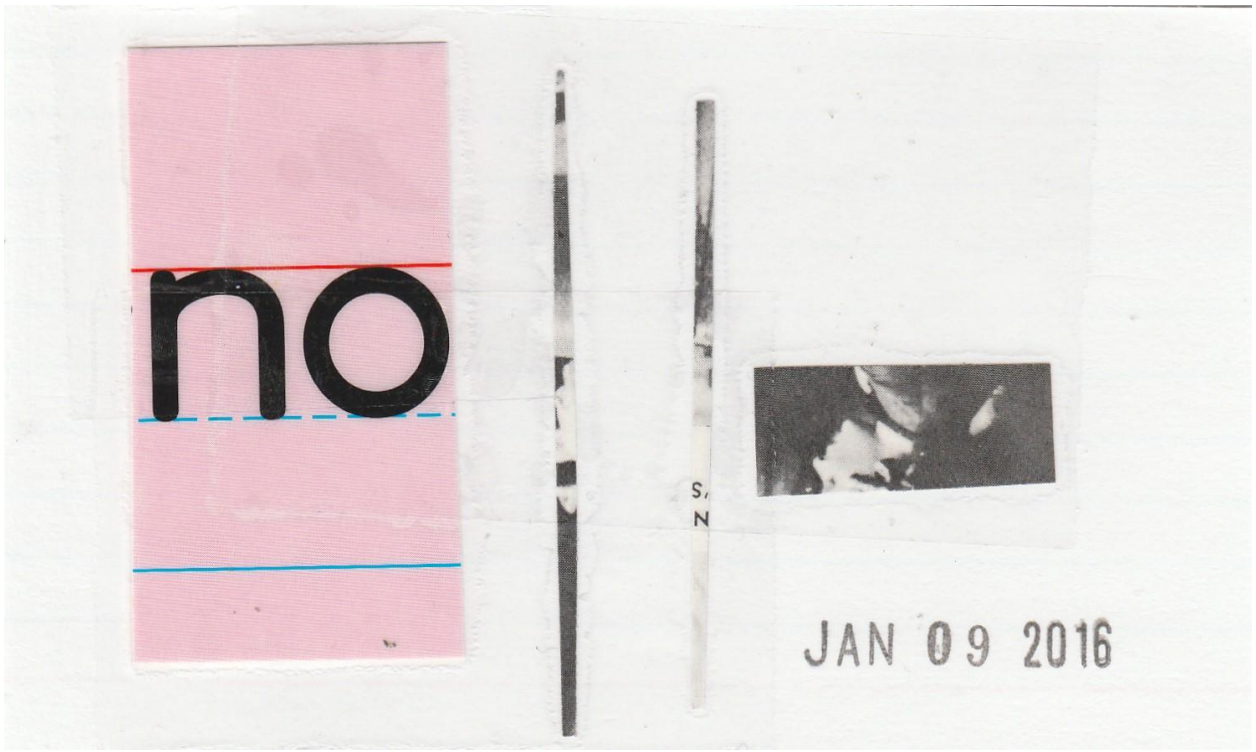
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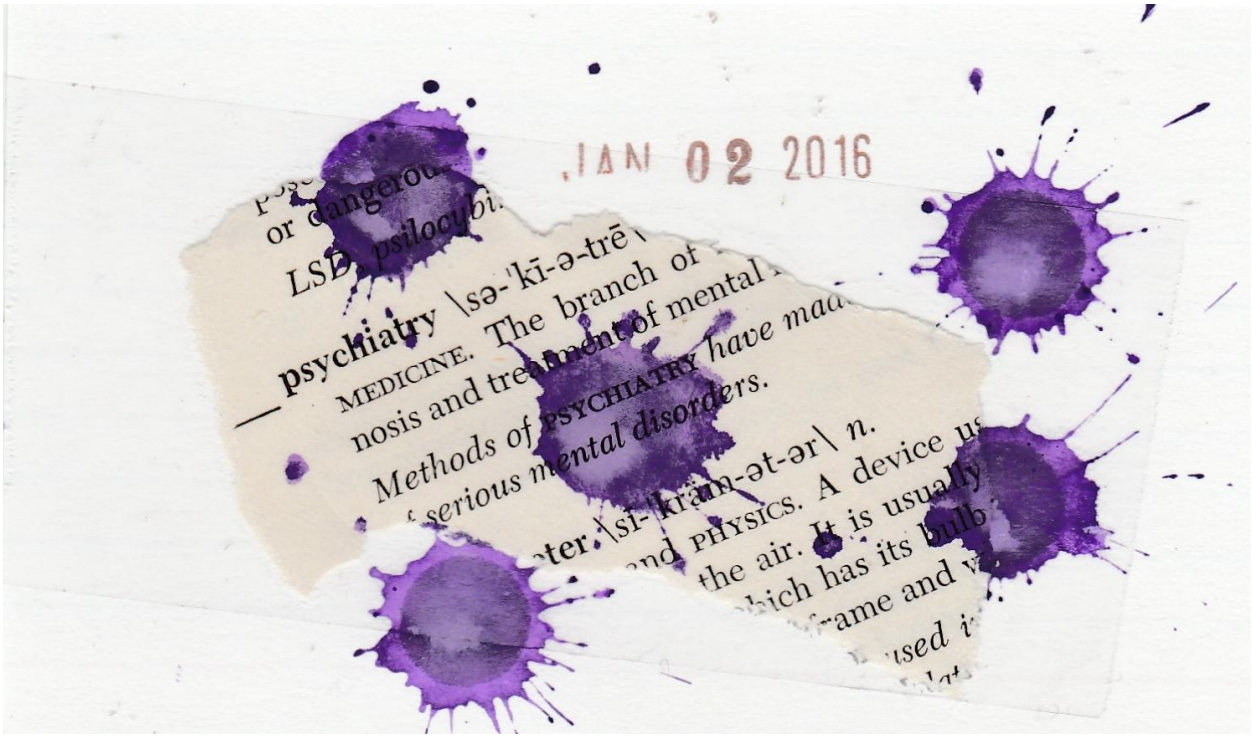
JAN 02 2016
psychiatry \sə-ˈkī-ə-trē\
MEDICINE. The branch of
nosis and treatment of mental
Methods of PSYCHIATRY have mad
serious mental disorders.
ter. \sī-ˈkräm-ət-ər\ n.
and PHYSICS. A device us
the air. It is usually
hich has its bulb
rame and w
used i

nucleic acid \n(y)ü-'klē-ik 'as-əd\
BIOLOGY and CHEMISTRY. A complex comp
found in all living cells. Composed of carb
nitrogen and phosphorus, it is though
growth in combination with proteins. I
nucleic acid (RNA) or deoxyribonucle
usually occurs in combination with pro
cleic acid and *ribonucleic acid.*

Deoxyribonucleic acid is a NUCLEIC AC
all living cells, and it may be the chem
tary characteristics.

nucleolus \n(y)ü-'klē-ə-ləs\ *n.*
spherical body found in th
vision and believed to be
esis within cells.

ılly contains one NUCL
cell types, there may be two or mo

nucleonics \ˌn(y)ü-klē-'än-iks\ *n.*
PHYSICS. The study and science of
the atomic nucleus, as in radioactiv

Geiger counters or scintillation co
search projects in NUCLEONICS.

nucleons \'n(y)ü-klē-ˌänz\ *n.*
CHEMISTRY and PHYSICS. The proto
the nucleus of any atom.

The total number of NUCLEONS *i*
for that particular atom.


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525 10th st sw
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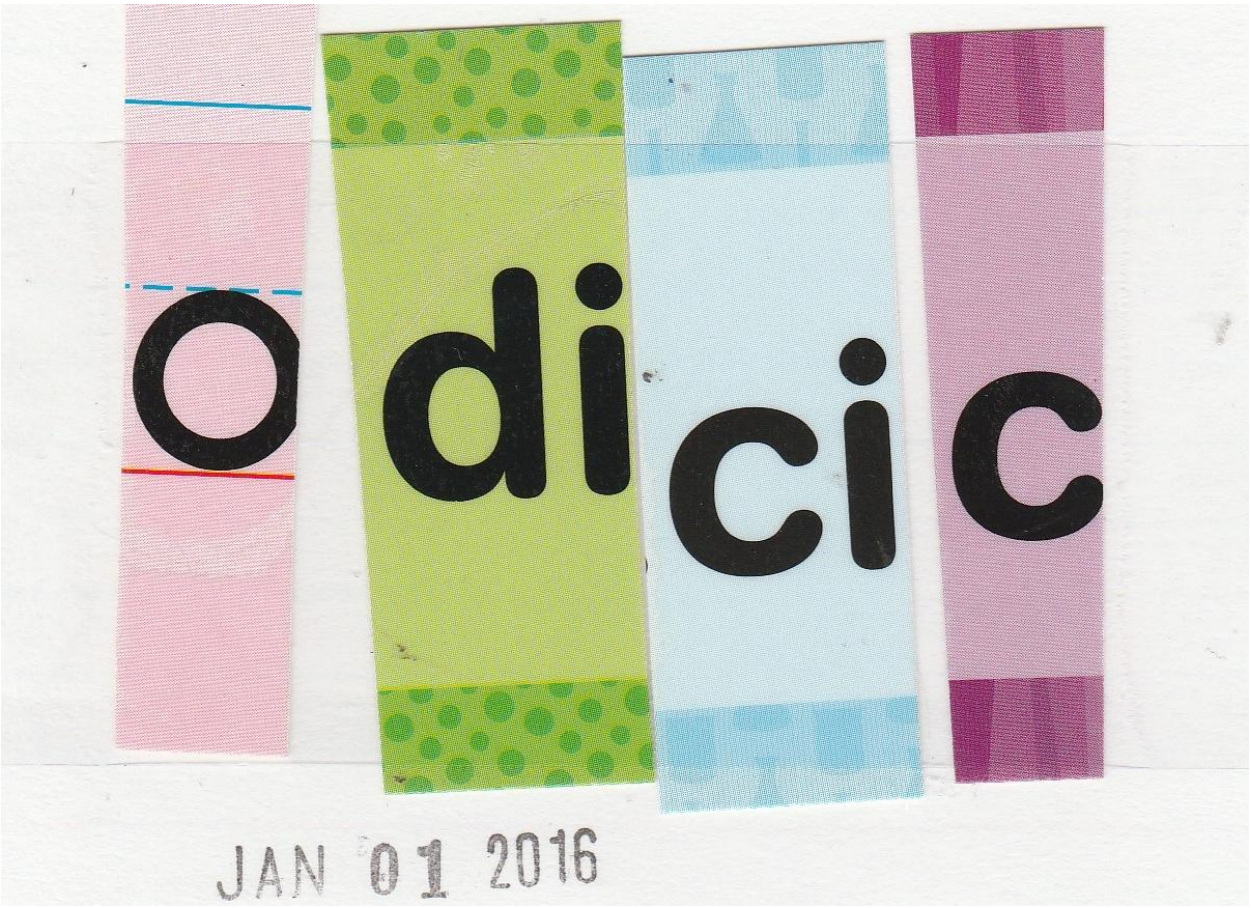
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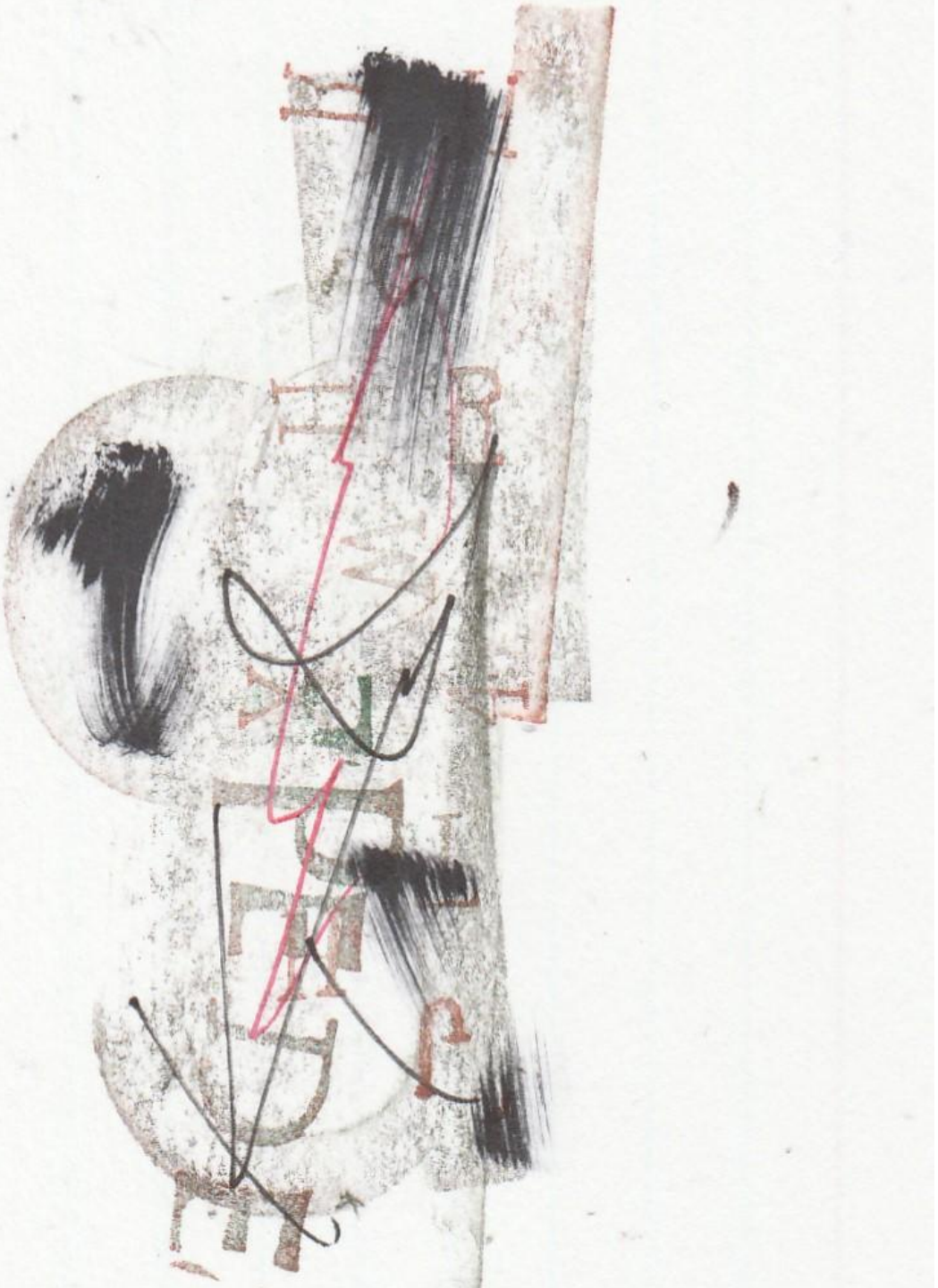

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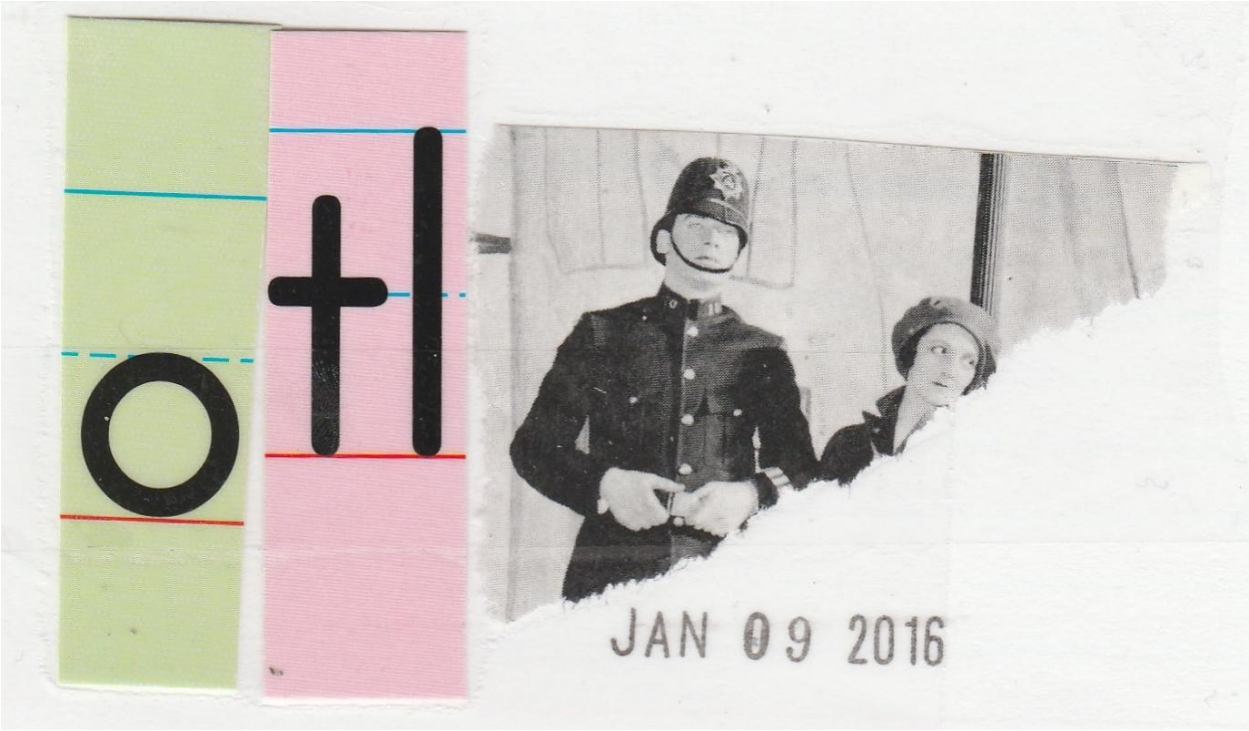
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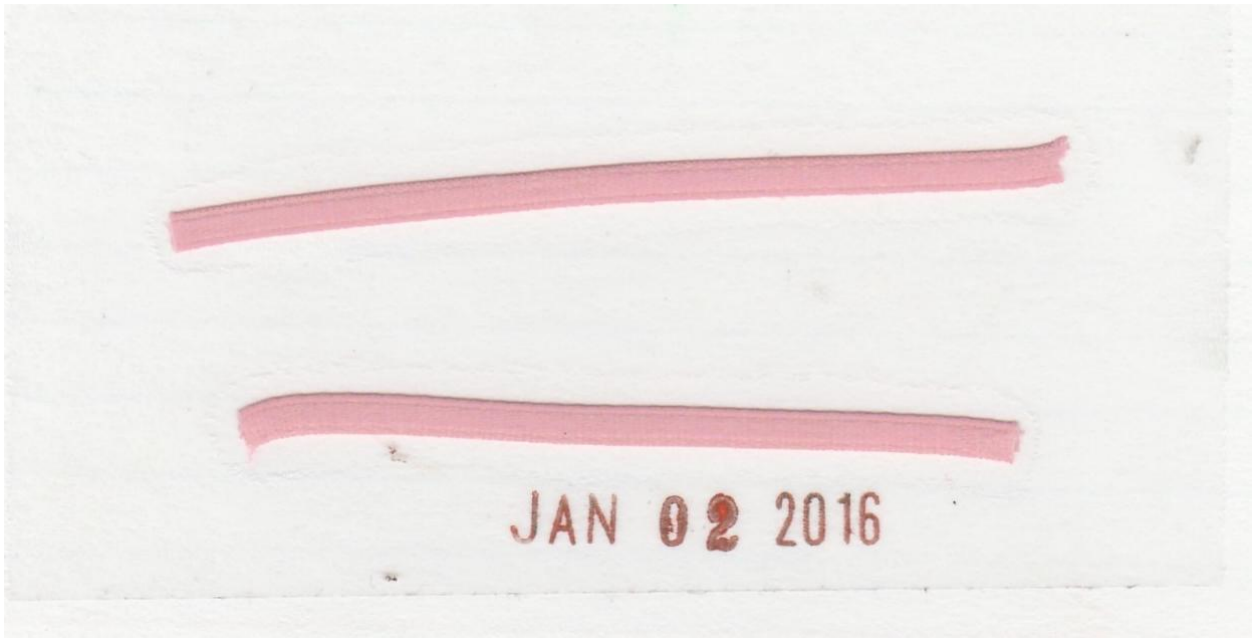
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Party deco

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Valentine greeting

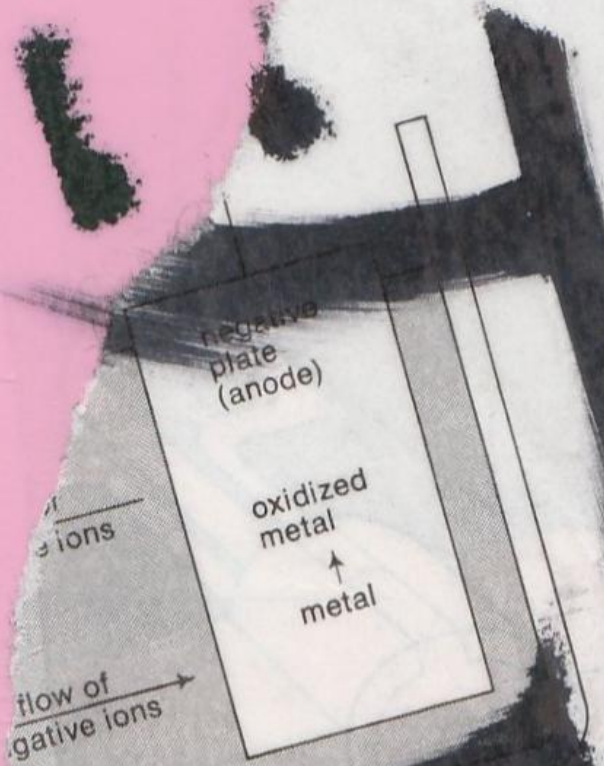


plate
(anode)
oxidized
metal
metal
flow of

force on the
parture of a particle from its
other than collision.

The PERTURBATION *of Neptune*
the discovery of Pluto.

petal \'pet-ᵊl\ *n.*

BOTANY. One unit of the inner
petal is often leaflike and colore

The scent, structure and color o
that attract pollinating insects a

petiole \'pet-ē-ˌōl\ *n.*

1. BOTANY. The stalk that joins
stalklike part.

A honey locust leaflet does not

petrifaction \ˌpe-trə-'fak-shən\

EARTH SCIENCE. The process by
animals are changed into stone

mixture, a solid, liquid or gas that has boundaries between it and other parts of the mixture ... A particular point, place or stage in a series of ...

From first ... ter, the moon is ...

phen...
CHEMIST... ... sol... d... ... m... ...yes, plastics ... is a p... ...; also called carbo...

A... ...rrosive to the skin, a ... tion in wa... ...sed as a disinfectant.

pheno... ...ōl-'thal-ē-ən\ *n.*
CHEM... ...l compound freque... ...indicate whe... acid or alkaline. It tu... alka-line ... colorless under ac...

PHEN... ...ed ... ...her *and is* ...

phenomenon \...
A fact or occurrence ... and explain... a scientific basis; someti...es, an unus... or rare fa... occurrence.

The au... borealis is a PH...OMENON *cau... by electrical turbance ... the atmosph...*

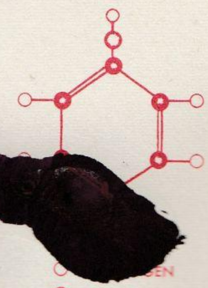
phenot... ...fē-nə-ˌtīp\
BIO... ...he physical ... ance of ... ...ism, resulting f... ...etic makeup ... *genotype.*

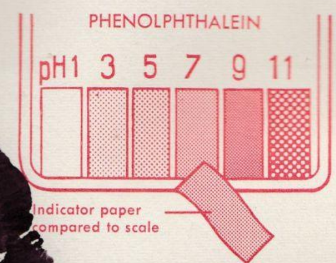
... PHENOTYPE ... *...ave a hybri... or pure (BB)*

phloem \'flō-ˌem\ *n.*
BOTANY. Food-conducti... ...r tissue, an... ...ted tissues, in seed plants and ferns, ...nsports or... ...ients both up and down; see *xylem*

Maple syrup is made fro... ...aken from th... of sugar maples.

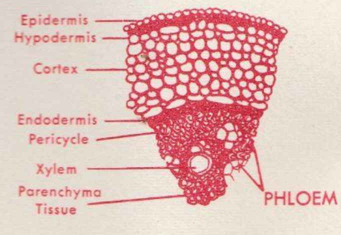
phosphate \'fas-fāt\ *n.*
CHEMISTRY. Any one of a number of compounds formed from phosphoric acid, H_3PO_4, by replacing one, two or three of its hydrogen atoms with metallic ions. Some of these compounds





...DICATOR PAPER CAUSES COLOR ...E WHEN ALKALINITY LEVEL OF ...TION IS BETWEEN 8.3 and 10.0

...CROSS SECTION OF SMILAX ROOT



are used as c gents, fertili r as water softeners.

Adenosine tri (ATP) is HATE *having an important functio roducing en muscular action in animals.*

phosphor \'fäs-fə

CHEMISTRY and s. Any substa hat gives off lig when energized by the orption of s orm of ener electricity or ch l energy.

Luciferin, the OR *in the en of firefli light when it is zed by ce iochemical r*

phorescence s-fə-'res-ᵊn(n.

EMISTRY and PHYSICS. An emi n of light fro substance r the energy source that s ulated the lig mission is moved.

ORESCENCE for as long as ten

ph

active chemically to be found uncombined occurs in five di forms (allotropes). Symbo number, 15; a ght, 30.9738.

allotrope of PHOSPH *oxidizes air, but the red allotro powder,*

A unit of illumination per square

mitted by a tele-

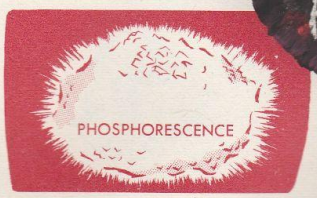
p

CH of science that deals with chemical reactio caused, or started, by light.

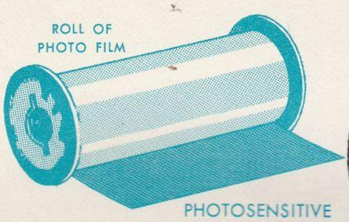
Scientists working in PHOTOCHEMISTRY *concentrate much effort toward understanding photosynthesis.*

photoconductivity \ˌfōt-ō-ˌkän-ˌdək-'tiv-ət-ē\ *n.*
PHYSICS. An increase in the electrical conductivity that certain solids, usually crystals, show when they absorb light.

Selenium, germanium and lead sulfide are three substances that show PHOTOCONDUCTIVITY.

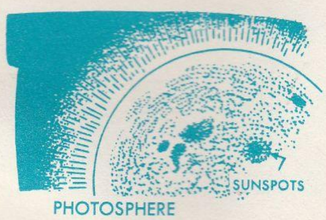


mums by controlling the length of light exposure to produce flowers for a longer season.



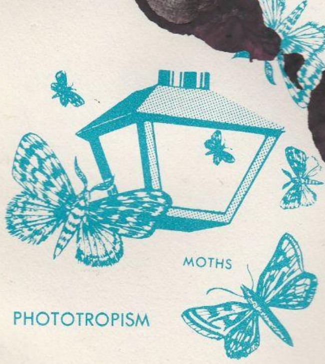
photosensitive \ˌfōt-ə-ˈse[illegible]\ *adj.*
CHEMISTRY and PHYSICS [illegible] to a substance that will undergo a chemical chang[illegible]nergy or p[illegible]ome other [illegible]ffect as a direct result [illegible]ing radia[illegible]especially [illegible]t energy.
[illegible] emulsion on photog[illegible]m is PHO[illegible]E.

[illegible]osphere \ˈfōt-ə-ˌsfi(ə)[illegible]
[illegible]NOMY. The visible, [illegible]us layer tha[illegible]rounds the [illegible]er stars. The photo[illegible]e of the su[illegible] a thickness [illegible]undred miles and [illegible]perature of [illegible] 5,500° C.
[illegible]les, sunspots and f[illegible]e all app[illegible]he sun's P[illegible]



photo[illegible]sis \ˌfōt-ə-ˈsin(t)-thə-səs\ [illegible]
BOTA[illegible]d CHEMISTRY. The process b[illegible] which sugar [illegible]nufactu[illegible] in plant ce[illegible] occurs through the combi[illegible] of carbo[illegible] [illegible]sence of light [illegible] the catal[illegible]ized by the equation $6CO_2$ + 6[illegible]
Throu[illegible]own food.

phototransis[illegible] \ˌfōt-ə-tranz-ˈis-tər\ *n.*
ENGINEER[illegible]nd PHYSICS. A semicondu[illegible]at acts as a [illegible]ductive cell.
The [illegible] meter used by photograp[illegible] HOTO- *[illegible] that measures light intens[illegible] read-*



[illegible]tä-trə-ˌpiz-əm\
[illegible] reaction [illegible]animals. [illegible]sitive or [illegible]by the wave- [illegible]
Mot[illegible]ce PHOTOTROPISM, *while plant roo[illegible]otropism.*

phototube \ˈfōt-ə-ˌt(y)üb\ *n.*
PHYSICS. A vacuum tube in which light strikes a photosensitive surface, causing free electrons to be given off. The electrons

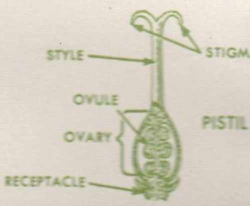
[redacted] hole effect [redacted] hōl i-ˈfekt\
PHYSICS. The phenomenon by which [redacted] is
formed on a screen by light passing th[redacted]
ing in an opaque [redacted] of cardboard [redacted]
[redacted] the PINHO[redacted] ch
[redacted] a c[redacted] a lens.

[redacted]

BOT[redacted] ling, or referring to, the leaf pattern formed by
lea[redacted] opposite each other on the petiole [redacted] that alter-
[redacted] of a single midrib [redacted] referr[redacted] pattern
[redacted]
The le[redacted] of the locust tree are PINNATE.

[redacted] bī-ˌōm\
[redacted] GY and EARTH [redacted] One of the four ma[redacted]
[redacted] of the earth, [redacted] being e[redacted] aphic [redacted] d
[redacted] s.
[redacted] BIOME, *the influence [redacted] ment*
[redacted] with the pioneer vegetation [redacted] lly en-
[redacted] physical conditions.

[redacted] reproductive [redacted] s in a flow[redacted] he pistil
[redacted] ally located [redacted] des the ova[redacted] style and
[redacted]
[redacted] to the stigma of the pistil may ge[redacted]
[redacted] rough the style to the ovary.



pistilla[redacted] pis-tə-lət ˈflau(-ə)r\
BOTA[redacted] that has pistils but no stamens, or nonfunc-
tional stamens[redacted]
A PISTILLATE *flower is sometimes called an imperfect flower.*

piston \ˈpis-tən\ n
ENGINE[redacted] A close-fitting disk or solid cylinder that slides
smoo[redacted] and down in the barrel of a pump or [redacted] hollow
cylin[redacted] engine.
[redacted] engine, a piston ring provides an airtight seal be-
[redacted] wall.

pitch \ pi[redacted]
[redacted] ined from the dis-
tillation of coal or petroleum. also [redacted] er, resinous substance
obtained from certain pine trees. 2. PHYSICS. That property of

planet

light and form images. It may be made of metal or glass, backed with silver.

The image seems to be as far behind a PLANE MIRROR *as the object is in front of it.*

planet \'plan-ət\ *n.*
ASTRONOMY. Any one of the nine most prominent celestial bodies that revolve around the sun; also, a similar object that may revolve around another star; see table, page [illegible].

Pluto, the last PLANET *to be discovered, is about 39 times farther from the sun than is the earth.*

planetarium \,plan-ə-'ter-ē-əm\ *n.*
ASTRONOMY. A device that projects a reproduction of the heavens, as they give time and [illegible] on the inside surface of a round [illegible] that [illegible] the movements of the sun, moon, [illegible] other celestial bodies; also, the building or room [illegible] a device and projector; also, a mechanical model of the solar system.

A PLANETARIUM *may be equipped to project the zodiac, ecliptic and solar circles and the Milky Way, as well as the stars, the planets and the moon.*

plankton \'plaŋ(k)-tən\ [illegible]
BIOLOGY. Floating or weakly-swimming microscopic or near-microscopic plants and animals at the surface of a body of water.

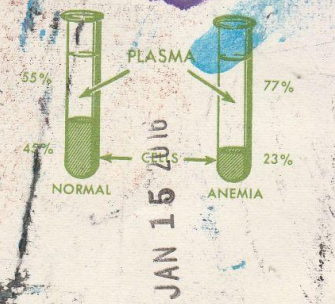
The whalebone whale feeds exclusively on PLANKTON.

plant \'plant\ [illegible]
BOTANY. Any living organism not of the animal kingdom, including seed plants, ferns, mosses, algae, molds, fungi and bacteria. Plants are usually capable of food manufacture by photosynthesis and their cells are often surrounded by cellulose walls [illegible]

Even though a PLANT *may appear to be inactive and otherwise different from animals, it carries out the same life processes generally characteristic of an animal.*

plasma \'plaz-mə\ *n.*
1. MEDICINE and PHYSIOLOGY. A straw-colored, sticky fluid, composing more than half of blood and containing proteins, inorganic materials, digested food and wastes. It is sometimes dried, stored and used for transfusions when whole blood is not available or suitable. 2. PHYSICS. A gas composed of electrically-charged particles with an equal, or nearly-equal, number of

PLANETARIUM



jim leftwich
525 10th st sw
roanoke, va 24016 usa

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JAN 16 2016

jim leftwich
525 10th st
roanoke, va 24

Garamond

72 Point

AB ium EFGHIJ

mallest of the solid particles in the bl
role in blood clotting and is also called

M *A* PLATELET *is about one-third to one-half* ORS *a red blood corpuscle.*

latinum \'plat-nəm\ *n.*
CHEMISTRY. A metallic element that is highly resis
tion and corrosion by most chemicals. It is used
XY elry, laboratory apparatus that must withstand
res and chemical attack and as a catalyst for
reactions. Symbol, Pt; atomic number, 78; a

ands and contracts with temperatu
as glass, it is frequen

abcdefghijkln

rstuvwxyz - .. *a heavy rain.*

evaporates quickly and leaves an alkaline mud

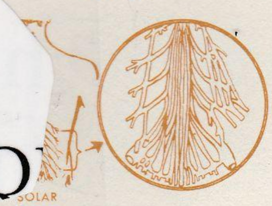
48 Point

ABCDEFGHIJK *n.* thin lin-

STUVWXYZabcd

PLEXUS

opqrstuvwxyz -.,:;!?" *chest.*



36 Point

s\ n.

ABCDE nd ZOOLOGY. An interlacement, or ne NOPQ s or lymphatic vessels.

YZ& abc EXUS *located behind the stomach branches out to ans within the abdominal cavity.*

k\ adj.

18 Point

ring to a rock body of igneous origin;

ABCDEFGHIJKLMNOP *hat formed far below the earth's*
abcdefghijklmnopqrstuvwxy

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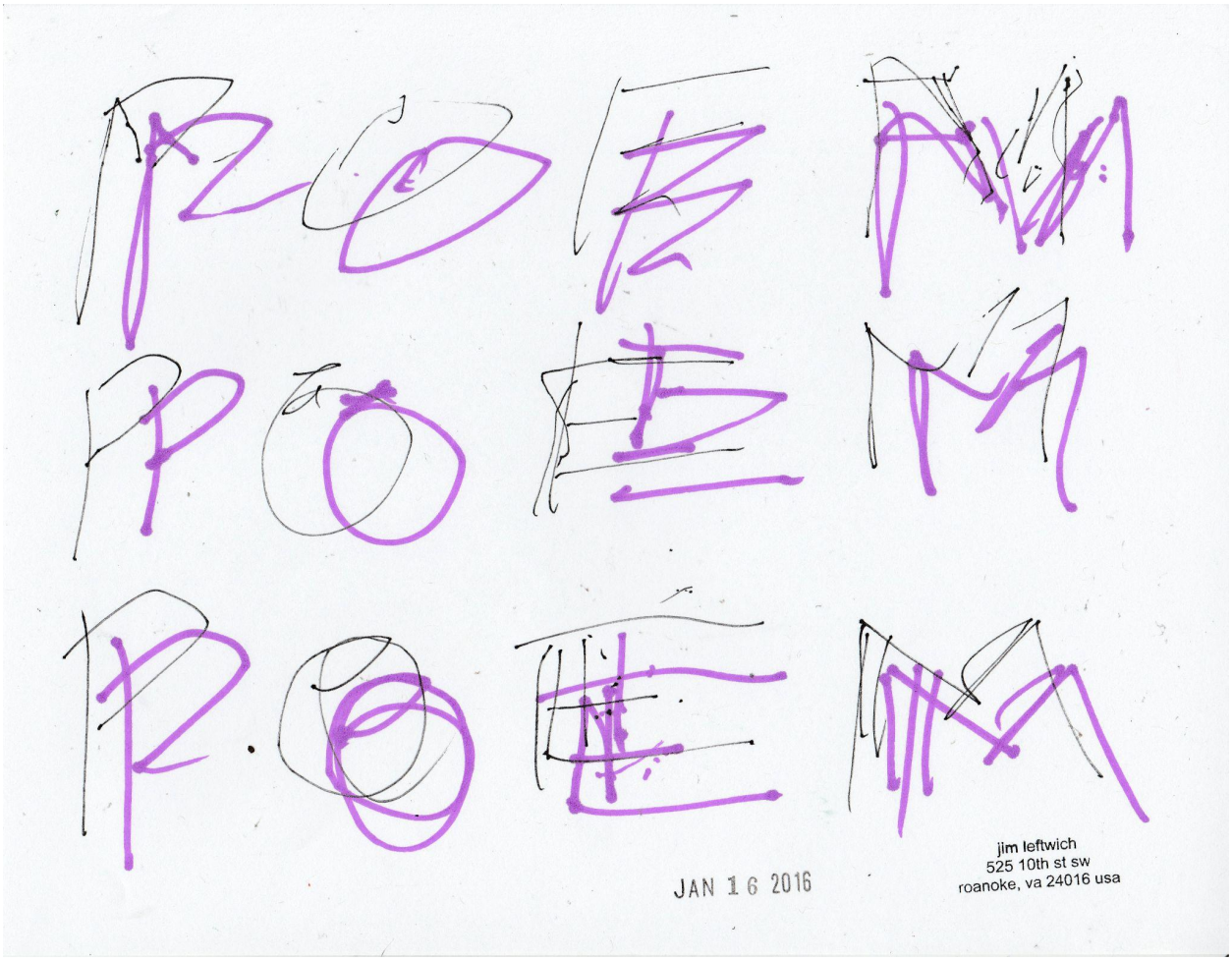

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jim leftwich
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polar air mass

jim leftwich
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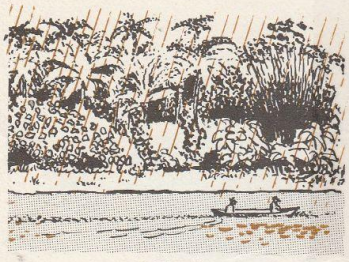
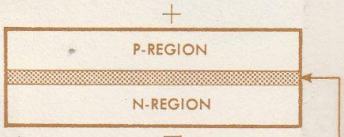
roanoke, va 24016 usa

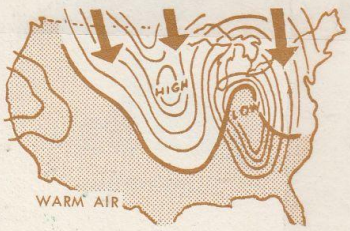


PLUVIAL
(CLIMATE)



P-N JUNCTION
(IN SOLAR CELL)

POLAR AIR MASS



JAN 15 2016

pluvial \'plü-vē-əl\ *adj.*
EARTH SCIENCE. Referring to rain, the action of rain or a period of abundant rain.

forests and jungles have a PLUVIAL *climate.*

s that deals with the mechanical

lf-contained underwater breath-
example of applied PNEUMATICS.

ıən\
en a p-region and an n-region in

a transistor or

e place where *intersect is the* POINT *at which they*

poikilothermi
ZOOLOGY. Re
temperature
homoiotherm

The body ten
toad or a frog
ture of the ai

polar air mass
EARTH SCIENC
acteristics in
tudes.

A summer POLAR AIR MASS *usually brings fair weather to the central and eastern United States.*


polysaccharide
such as pulse waves, blood pressure, respiratory movement
and brain waves; popularly called a lie detector.
A POLYGRAPH can b used to detect the physiological reactions
that occur when a bject is not telling the truth.
polyhedron \,päl-i-' -drən\ n.
MATHEMATICS. A sed geometric solid formed by portions of
plane surfaces ca faces.
The faces of a PO EDRON intersect in straight lines called the
edges of the pol ron.
polymer \'päl-ə-
CHEMISTRY. A und of high molecular weight produced
when small m link together to form larger molecules in
a long chain.
Polyisopren imilar in structure to natural rubber, is
a POLYMER
polymeriza ə-rə-'zā-shən\ n.
CHEMIST y which two or more individual mole-
cules mbine to form a large molecule (poly-
mer). small molecules join to form one very
large a molecular weight of several thousand.
It is uce such products as plastics and synthetic
fib
W cules in liquid form undergo POLYMERIZA
ne, a solid plastic often used to make
species
d the
man-of-war, made up of stinging, floating,
productive individuals, exhibits complex POLY-
nō-mē-əl\ n.
lgebraic expression having one or more
considered to have two or more terms.
three terms is called a trinomial.
polysa al-i-'sak-ə-,rīd\ n.
CHEMISTRY. Any one of several carbohydrate compounds that
189
SHE
8.5"
(216x279mm
POLYMER
(Polyethylene)
MONOMER
(Ethylene)
Carbon atom
Hydrogen atom
PORTUGUESE
MAN-OF-WAR
POLYMORPH
JAN 16 2016
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roanoke, va 24016 usa

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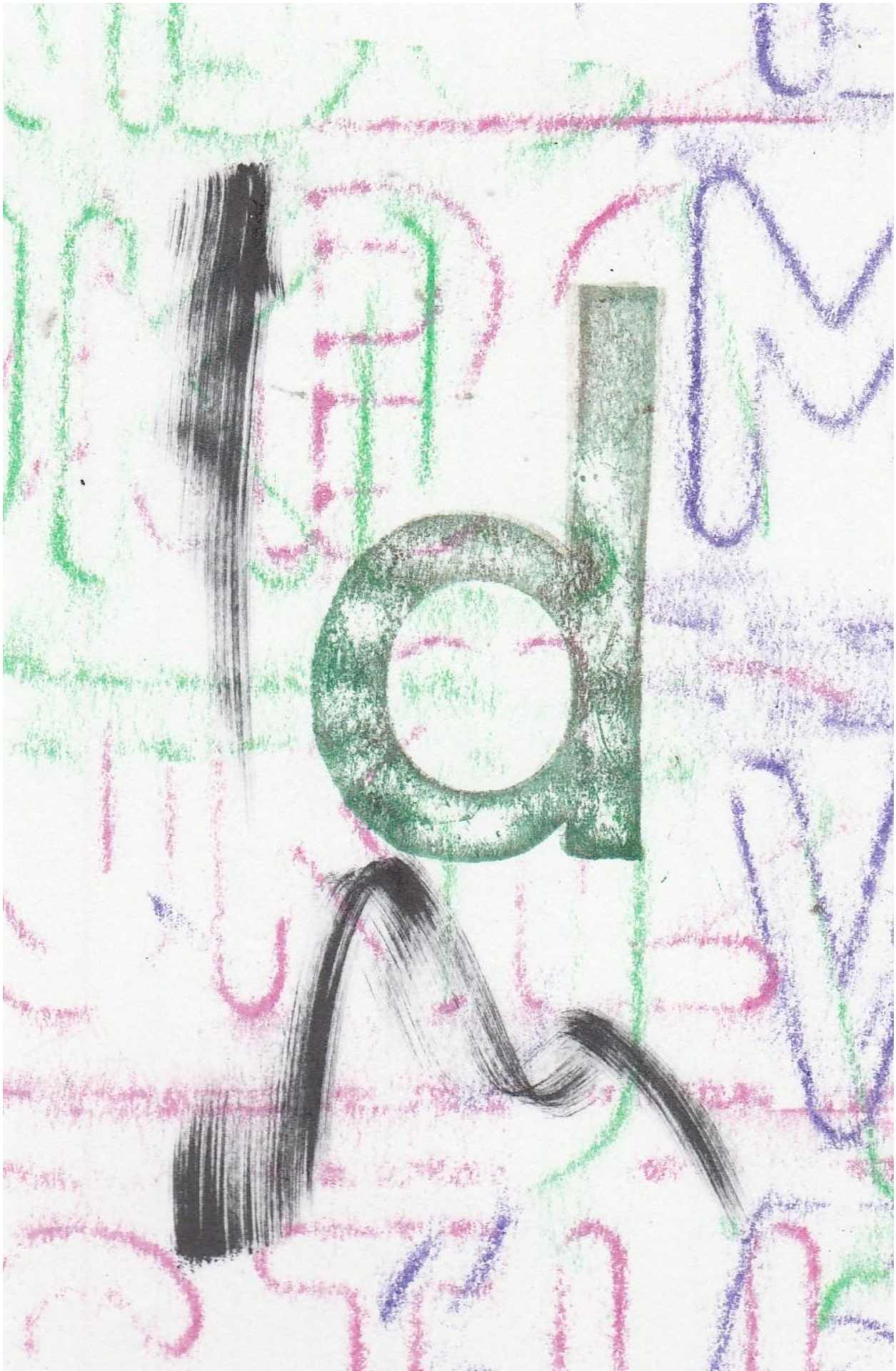
roanoke, va 24016 usa
JAN 12 2016



l has a positive electric charge as

hloric acid, each POSITIVE ION *is*
trode.

inal points (positive and nega-
attracts electrons or other nega-
ositive charge.

by electricity, oxygen is released
ogen at the negative pole.

atomic particle having the same
rying a single positive electric
carries a single negative electric

ith an electron, they both disap-
n in their place.

ring to a part that is situated be-
the rear; also, toward the back,
rection away from the head end
y symmetrical.

he POSTERIOR *end of the vertebral*


adas con sal de mar
PREMIUM
GALLETAS DE SODA
PER 5 CRACKERS – POR 5 GALLETAS
CALORIAS
JAN 20 2016
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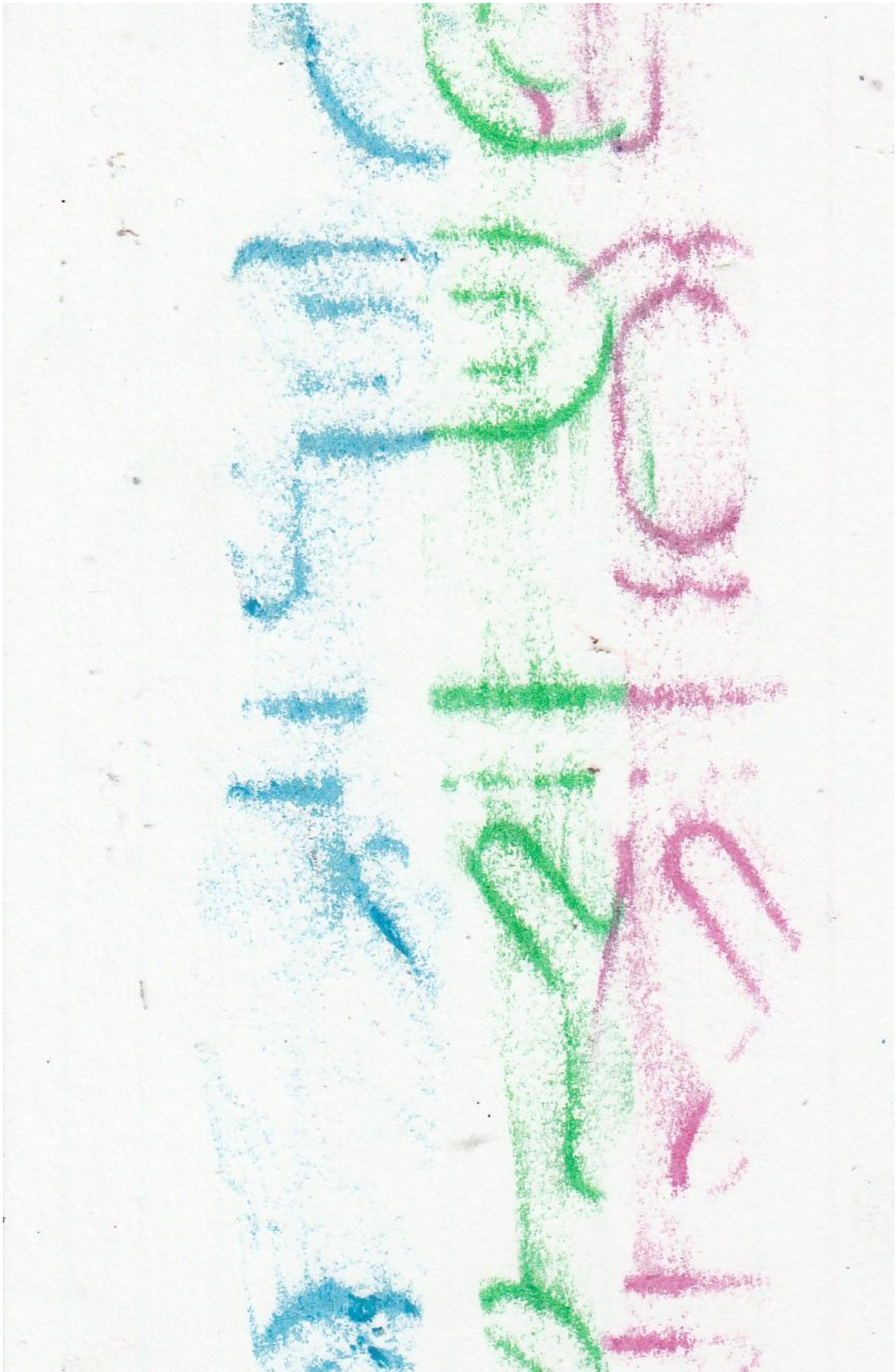
525 10th st sw
va 24016 usa




wxyz
veg
flour
seasoning
drinks
ketchup 2
macaroni
waffles
syrup
cereal
cheese
cups
plates
paper towels
sugar
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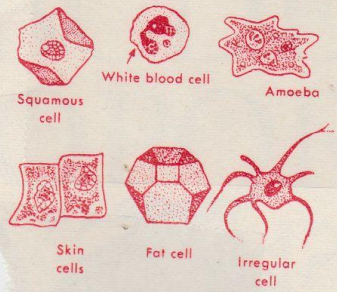
JAN 14 2016
17

60 Point

48 Point

42 Point



PROTOPLASM

nary hydrogen atom, and at least one is contained in the nucl of every atom.

If a PROTON *is injected into an atomic nucleus, the at ber of the nucleus is increased by one.*

protoplasm \'prōt-ə-ˌplaz-əm\ *n.*
BIOLOGY. The complex matter of which l posed; living matter; living material;

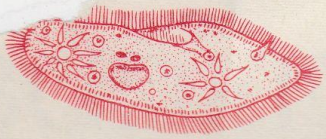
Although many of the properties PROTOPLASM are known, it has laboratory.

protoplast \'prōt-ə-ˌplast\
BOTANY. The protoplas

A cell wall encloses,

prototype \'prōt-ə-ˌ
1. BIOLOGY. The
2. ENGINEERING.
which later mod

The PROTOTYPE



PROTOZOAN
PARAMECIUM

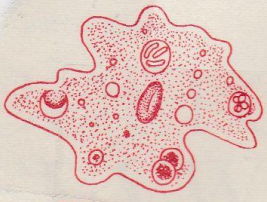
protozoan \ˌprōt
ZOOLOGY. Any a
includes one-cel
water-dwelling.

A parasitic PROTO
animal.

JAN 02 2016

proximal \'präk-sə-məl
ANATOMY and BIOLOGY
point or near the attach
an animal or organism, as

A PROXIMAL *fracture of the steel pin.*



PSEUDOPODIUM
AMOEBA

pseudopodium \ˌsüd-ə-ˈpōd-ē-əm\ *n.*
ZOOLOGY. In amoebas and similar kinds o
a temporary flowing extension of protoplas
locomotion and ingestion.

White blood corpuscles pass through capillary walls by extending a PSEUDOPODIUM *between the cells of the vessel wall.*

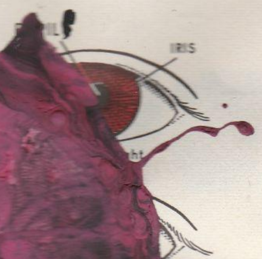
P-shell \'pē-ˌshel\ *n.*
CHEMISTRY and PHYSICS. One of the seven principal energy levels, identified by the letters K, L, M, N, O, P and Q, th

pupa \'pyü-pə\ *n.*
ZOOLOGY. The form of an insect undergoing the third of the four stages of metamorphosis. Th[…] form in this stage shows little activity as it changes from […] adult. It is […]ften enclosed within a cocoon or […]tective enc[…]

Although the mosquito PUPA […]*ctive, it do*[…]*d until it emerges from the wate*[…]*dult.*

pupil \'pyü-pəl\ *n.*
ANATOMY and ZOOLOGY. In vert[…]nd a few o[…] ma[…] circular or oval-shape[…] surrounded ir[…]. It permits light to […] the back pa[…] ey[…]

In […] *of the* PUPIL *decreases* […] *the intensity* […] *striki*[…]*creases.*



purebred \[…]ed\ *adj.*
ZOOLOGY. R[…]imals with a la[…]er of c[…] hereditary c[…] that have be[…]oped breeding.

PUREBRED *animals* […]*nd pass*[…] *acteristics that incr*[…] *ations.*

putrefaction \ˌpyü-trə-'fak-sh[…]
BIOLOGY. The gradual decay […] caused by the action of mic[…]

PUTREFACTION *of dead plants an*[…]*trates a*[…] *other materials necessary to plant growth*[…]

pylorus \pī-'lōr-əs\ *n.*
ANATOMY. The opening between th[…] intestine. Its contracting and relaxi[…] the rate at which the stomach e[…] intestine.

[…]*s of muscles sur*[…]*rcing its*[…]

pyramid \'pir-ə-ˌmid\ *n.*
MATHEMATICS. A polyhedron with […] face, called the base, is a polygon that […] of sides, while the other faces, called latera[…] angles having one point, called the vertex of the py[…] common.

The altitude of a PYRAMID *is a perpendicular extending from the vertex of the pyramid to the plane of the base.*

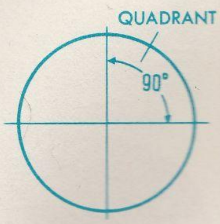

pute
JAN 02 2016

a

Q

Q-s[illegible]
[illegible] gy
le[illegible] that
el[illegible] n; the [illegible] ghest,
pr[illegible] ons may occu[illegible] e Bohr
mo[illegible]

In t[illegible] *the* Q-SHELL [illegible]
the e[illegible]



quadrant [illegible]
1. MATHE[illegible]
two perpen[illegible]
equal to $\pi/2$ [illegible] instru-
ment used in [illegible]

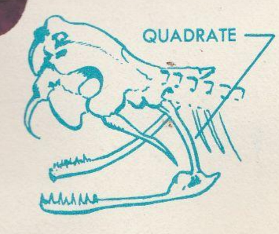
The first QUADR[illegible] *rectan*[illegible] *rdin*[illegible] *e is the portion lying abo*[illegible] *x-axis*[illegible] *t of* [illegible]

quadrat \'kwäd-r[illegible]
BIOLOGY and [illegible] ENCE. A[illegible] ular sa[illegible] of land used in t[illegible] ensus of [illegible] nd animals [illegible] live in an area; al[illegible] of land [illegible] experimental pur-poses.

The study [illegible] *on the n*[illegible] *of a hill yields differ*[illegible] *m a simil*[illegible] *ation of th*[illegible] *slope.*

quadrate \'kwäd-ˌrāt\ *n.*
ZOOLOGY. In most vertebrates below m[illegible] bone or [illegible] laginous structure that joins the lowe[illegible] the skull. especially prominent in reptiles.

The QUADRATE *has evolved into a bone of the inner ear in mam-mals.*



quadratic equation \kwä-'drat-ik i-'kwā-zhən\
MATHEMATICS. An equation, or statement of equality between two expressions, in which 2 is the highest power of the unknown.

An equation such as $4x^2 + 2x + 6 = 0$ *is a* QUADRATIC EQUA-TION.

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q… formula \…t-ik 'fȯr-myə-lə\
…ATICS. The … $= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ … in which
… a, b and c … ation of the … $bx + c$
…bstituted in … find its ro…

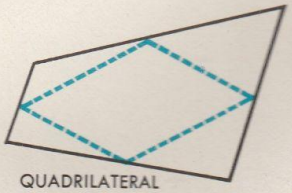
The …TIC FORMUL… used to f… roots of
$2x^2$ … $5 = 0$ are x … $x = -5/2$

quadrature \'kwäd-rə-ˌchu…
1. ASTRONO… The relatio… two heav… ies when
lines draw… ach of th… e center … arth form
a 90-degre… 2. MATH… The pr… squaring,
or determin… imensio… square w… is equal
to that of an… en su…

When the moo… of the
n appears … at sun-
sunset

q… MA… ICS. A …

The … ing …
para…


QUADRILATERAL

quadruped \'kw… n.
ZOOLOGY. A fo…

The cow is …

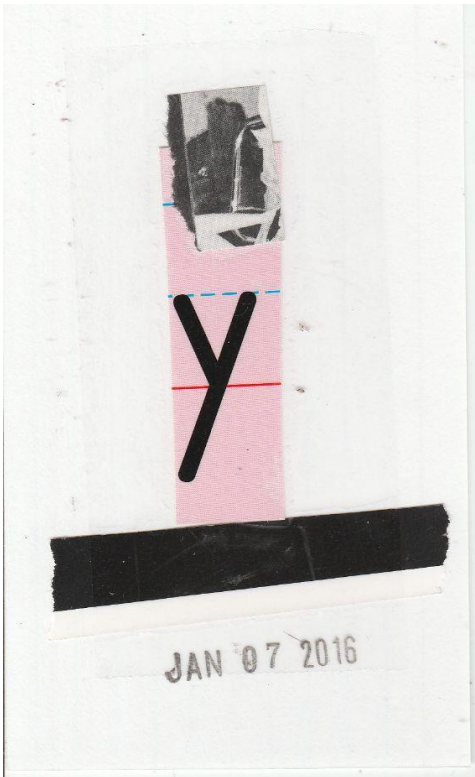
qualitative \…
Referring …
or com…
wh…
amoun…

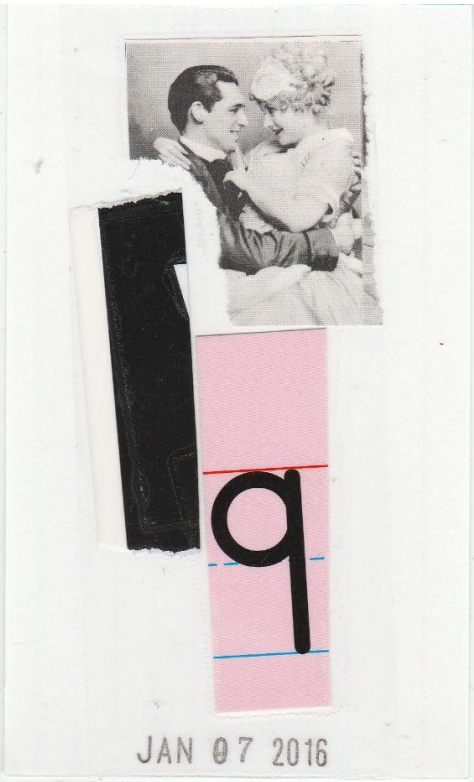
The QUA… …
cate what com… …ount of
each.

QUADRUPED

quantitative \'kwän(t)-ə-ˌtāt-iv\ *adj.*
Referring to the properties of substances or processes, such as their mass, length, speed or duration, as in the analysis of a substance to determine how much of each component exists; see *qualitative.*

One QUANTITATIVE *difference between two objects can be determined by comparing their weights.*


y
JAN 07 2016


l
q
JAN 07 2016


st
CLOROX
JAN 07 2016


petitors'
k to School.
5.99
16GB
ly
JAN 07 2016

R
JAN 02 2016

radio astronomy \'rād-ē-ˌō ə-'strän-ə-mē\
ASTRONOMY. The study of celestial bodies by the radio waves they emit, as contrasted with optical astronomy in which light waves are studied. Radio astronomy may include the use of radar to study the moon, [illegible]s and other relatively-nearby objects.

The [illegible] of radio sta[illegible]ne phase of RADIO ASTRONOMY *[illegible]ulted in ne[illegible]e about the com[illegible]s of the u[illegible]*

radioautog[illegible] [illegible]d-ē-ō-'ȯt-ə-[illegible]
PHYSICS. T[illegible]ned area on [illegible]graphic film[illegible]d by radiation[illegible] radioactive [illegible]

The RADIOAUTOGRAPH *is used in r[illegible]o locate ra[illegible]e atoms in plants.*

radio beam \'rād-ē-[illegible]
[illegible]ERONAUTICS. A nav[illegible] beam. Se[illegible]m.

[illegible]on dating \ˌrād-[illegible] bən'[illegible]
[illegible] and PHYSICS. [illegible]

radi[illegible] [illegible]'rād-ē-[illegible]
ENG[illegible] P[illegible]
quency b[illegible]
cycles per seco[illegible]

A RADIO FREQUE[illegible]*er seco[illegible] very low frequen[illegible]*

radioisotope \ˌrād-ē-ō-'ī-sə-[illegible]
CHEMISTRY, MEDICINE and [illegible]dioactive isotop[illegible]
radioactive isotope.

radiology \ˌrād-ē-'äl-ə-jē\[illegible]
MEDICINE. The branch o[illegible]
radiant energy, especia[illegible]
[illegible]nt of disease or in[illegible]

[illegible] the f[illegible]g of interna[illegible]

radioluminescence \ˌrād-ē-ō-ˌlu[illegible]
PHYSICS. The glow, or emission of ligh[illegible]tances that have absorbed energy from a radioactive source.

The visible light of a radium-coated watch dial is an example of RADIOLUMINESCENCE.

TLPress Roanoke VA USA 2021